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GLACIER NATIONAL PARK / MONTANA
August 1989

UNITED STATES DEPARTMENT OF THE INTERIOR / NATIONAL PARK SERVICE

This *Draft Transportation Plan/Environmental Assessment* presents four alternatives, including a no-action and a preferred alternative, for rehabilitating the culturally significant Going-to-the-Sun Road and other secondary roads and turnouts, reducing traffic congestion, and facilitating visitor movement to, from, and within Glacier National Park. Each alternative includes strategies for road and turnout rehabilitation, implementation of a public transit system, and traffic management. Under the no-action alternative, no significant changes or new environmental effects would occur. Under the preferred alternative (A) and other action alternatives (B and C), proposed road and turnout improvements, provision of a public transit system, and implementation of traffic management actions would enhance the overall visitor experience because safety, ride quality, and traffic conditions would improve. Road and turnout rehabilitation activities would cause minor short-term inconveniences for visitors and would involve removal of roadside bedrock (10 cubic yards under A and 985 cubic yards under B and C) and disturbance of soils and vegetation (60 acres under A and 180 acres under B and C).

Comments should be addressed to

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West Glacier, MT 59936

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"The greatest achievement in the construction of Going-to-the-Sun Highway is not its character as an engineering feat. This must be considered only secondary to its greater function, that of making accessible to modern transportation the age-old wonders of the engineering of time and the elements – the movement and construction of a range of mountains, the excavation of great channels by glaciers whose probable dimensions must tax even the most vivid imagination. Our only prayer must be that our work may be truly a component part of this wonder of nature, that we may not have marked that which we, with all our science, knowledge, and experience, could never reproduce."

Jean Ewen

SUMMARY

This *Draft Transportation Plan/Environmental Assessment* provides alternative strategies for dealing with traffic and transportation issues related to the culturally significant Going-to-the-Sun Road and some secondary roads and turnouts within Glacier National Park. Primary issues include major repair needs, design limitations, and safety hazards on Going-to-the-Sun Road and secondary roads and turnouts; traffic loads and parking demands during peak periods; and changing visitor needs and interests concerning travel to, from, and within the park.

Four alternatives, including a no-action and a preferred alternative, have been developed. Each alternative includes proposed actions for road rehabilitation, implementation of a public transit system, and traffic management. Treatments for Packers Roost and Camas roads, the Sun Point intersection, and 130 turnouts on Going-to-the-Sun Road are also proposed. All proposed actions have been analyzed for their beneficial and adverse effects on visitor use and the environment and for their cumulative impacts on cultural resources.

Under the no-action alternative present management and travel and use patterns would continue, and no road rehabilitation except for routine maintenance, vista clearing, and repairs necessary to reduce safety hazards would be undertaken. Bus service would not be expanded beyond present levels, and no additional traffic management actions would be implemented. Few new impacts on visitor use or the environment would occur. However, if the road was not rehabilitated, it could ultimately fail.

Alternative A, the National Park Service's preferred alternative, would involve repairs to Going-to-the-Sun Road to correct drainage problems, repair parapets, and rehabilitate the road while maintaining its historic character and ambience. The existing road width would be maintained or decreased during rehabilitation. Shuttle bus service would be instituted during the peak season. Buses would depart every two hours from West Glacier and St. Mary and would provide service to all major facilities, trailheads, and scenic areas along Going-to-the-Sun Road. Parking/staging areas and other facilities would be developed to support this service. Management options to reduce traffic on the road during peak hours (informational pamphlets, signs, radio broadcasts, interpretive programs, promoting loop drives through the park, promoting use of the regional public transportation system; limiting the number of vehicles on Logan Pass, and imposing vehicle-length restrictions on the pass) would be implemented as necessary.

Under alternative B Going-to-the-Sun Road would be repaired and rehabilitated, and sections 3, 4, and 7 would be widened to 24 feet with 1-foot turf shoulders where possible. Rock protrusions above the driving lanes would be removed in the sections 4 and 5. Shuttle bus service as described in alternative A would be instituted every four hours during the peak season, and parking would be provided. Traffic management options would be implemented as necessary, except that vehicle-length restrictions would not be imposed.

Alternative C would involve the same actions for Going-to-the-Sun Road as alternative B, except that section 8 would also be widened to 24 feet with 1-foot turf shoulders. Under this alternative the proposed shuttle bus service would operate every hour during June and September and every half-hour during July and August, and hourly service from St. Mary to Many Glacier would also be established. Parking and support facilities would be developed. All of the traffic management options described in alternative A would be implemented as necessary to reduce traffic congestion during peak hours.

All of the alternatives would include necessary repair and rehabilitation of Packers Roost and Camas roads, the Sun Point intersection, and 130 turnouts on Going-to-the-Sun Road. The historic quarry operation would be evaluated for possible future use and interpretation.

The impacts of the three action alternatives would be generally beneficial. Rehabilitation of Going-to-the-Sun Road and other roads and turnouts would improve safety, ride quality, and traffic conditions while maintaining the road's historic character. Visitors might experience short-term inconveniences because of delays, noise, dust, and fumes during rehabilitation work. There would be an irretrievable loss of roadside bedrock (A - 10 cubic yards, B - 985 cubic yards, C - 985 cubic yards), and road and turnout improvements would disturb some soils and vegetation (A - 60 acres, B - 180 acres, and C - 180 acres). No significant effects on wildlife, threatened or endangered species, floodplains or wetlands, air quality, or known cultural resources would occur under any of the alternatives.

The public transit system proposed under the action alternatives would provide opportunities to view the road for visitors who arrive by means other than private vehicles, those afraid to drive the pass, and those with oversize vehicles. Employees and hikers would be able to travel more easily from one trailhead or developed area to another.

Implementation of the traffic management actions would reduce traffic congestion on Going-to-the-Sun Road. Under the most restrictive traffic management actions, drivers would experience delays while waiting for congestion to clear to the point that they could move through the checkpoints. Use by motorists with vehicles longer than 20 feet could be restricted during peak hours under alternatives A and C.

This *Draft Transportation Plan/Environmental Assessment* will be available for public review for 30 days. Based on the analysis contained in the document and on comments received during the review period, a final transportation plan will be developed and approved. The final plan will be released to the public before it is implemented.

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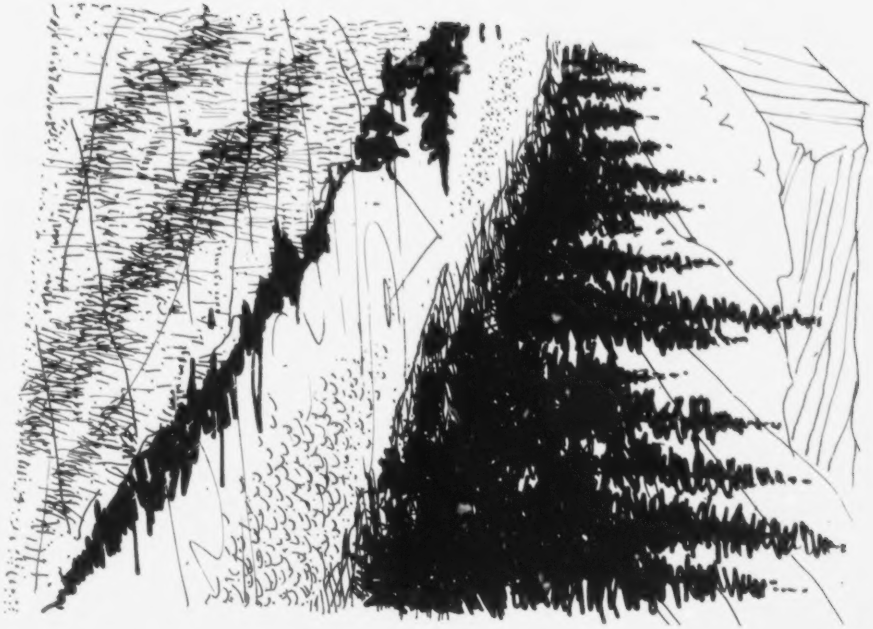

PURPOSE OF AND NEED FOR THE PLAN

The purpose of this transportation plan is to provide for safe and enjoyable travel within the area of Glacier National Park that includes Going-to-the-Sun Road and related attractions. The plan is needed to correct road deficiencies, reduce safety hazards, and solve traffic and transportation problems in this area and to identify the most feasible public transit system for future use.

BACKGROUND

Glacier National Park is situated on the Canadian border in the northwestern section of Montana. The park is part of a vast mountain recreation complex that includes superb natural and cultural resources in Canada and the United States.

Going-to-the-Sun Road, which bisects the park and traverses the Continental Divide, is the only park road that provides access from one side of the park to the other and allows visitors to see examples of all of the features for which Glacier is known. Major developments along Going-to-the-Sun Road – West Glacier, Apgar, Sprague Creek campground, Lake McDonald Lodge, Avalanche Creek campground, Logan Pass visitor center, Rising Sun, and St. Mary – and other visitor attractions provide a variety of interpretive facilities, amenities, and services.

The 1977 *Master Plan* and 1985 "Statement for Management" for Glacier National Park identified Going-to-the-Sun Road as the primary visitor use facility. The master plan proposed that the road be maintained to provide a cross-section of park features for enjoyment by day-use visitors and a threshold for wilderness use. The plan further proposed that a public transit system ultimately serve Going-to-the-Sun Road. A special study was called for to analyze system requirements and recommend feasible solutions. In addition, the study was to address the problems of noise and air pollution and the interpretive potential and overall aesthetic atmosphere. Parking facilities to support the system were to be provided at suitable locations. Particular consideration was to be given to concession facilities and campgrounds within the Going-to-the-Sun Road corridor. The alternatives in this *Draft Transportation Plan/Environmental Assessment* describe and analyze specific actions to implement master plan transportation strategies.

Other directions for this planning effort came from the *Interpretive Prospectus* (NPS 1980) and cultural resource preservation laws and procedures. The *Interpretive Prospectus* for the park identified the proposed Apgar (West Glacier) information center (see the *Apgar Headquarters Environmental Assessment/Development Concept Plan* [NPS 1982a] for further details) and the St. Mary visitor center as the locations for interpretive exhibits, leaflets, radio messages, and bulletin boards. These media would provide comprehensive explanations of the transportation system, the history of transportation in the park, bus schedules, and vehicle size regulations for Going-to-the-Sun Road. The report also recommended that interpretation of the natural and cultural resources along the road be provided by driver narration.

Going-to-the-Sun Road is listed on the National Register of Historic Places as a significant cultural resource. The National Historic Preservation Act of 1966 (16 USC § 470 et seq) states that any project that will affect a national register property is subject to section 106 procedures, as defined in the act and codified in 36 CFR, part 800.

A memorandum of agreement was signed by the Rocky Mountain regional director of the National Park Service, the Montana state historic preservation officer, and the Advisory

Council on Historic Preservation in May 1987. The memorandum addressed repair to be accomplished on the Triple Arches and Loop walls on Going-to-the-Sun Road. Stipulations included documentation required for the repairs, review of plans before the start of work, and avenues to settle disputes and amend or withdraw from the agreement. The agreement also stipulated that the Park Service prepare and adopt a Going-to-the-Sun management plan as a basis for subsequent management decisions. The park has prepared a *Cultural Resource Plan, Going-to-the-Sun Road* (NPS 1989) to establish a broad management philosophy for that road. Further detail on the components of the cultural resource plan (CRP) can be found in the "Affected Environment, Cultural Resources" section of this transportation plan.

ISSUES

In 1988, there were 1,817,733 visits to Glacier National Park. On Going-to-the-Sun Road, which is traversed by the majority of park visitors, a 1984 study showed the average daily traffic (ADT) figure for August as 4,790 vehicles at the west entrance station and 3,220 ADT at the east entrance station. Visitation has remained virtually constant over the past few years, but the potential for a slight increase of 1 to 1½ percent per year is possible in the near future. National Park Service *Management Policies* (NPS 1988) state: "Park roads will be well constructed, reflect the highest principles of park design, enhance the visitor experience, and be sensitive to environmental factors. Park roads are generally not intended to provide fast and convenient transportation; they are intended to enhance the quality of a visit while providing for safe and efficient travel. . . . Where roads are chronically used to capacity, the use of public transit or limitations on use will be considered as alternatives to road improvements. Although they may not meet current engineering standards, some existing roads are cultural and recreational resources, and their values will be preserved. . . . Specific road designs are subject to NPS *Road Standards*, which are adaptable to each park's unique character and resource limitations." NPS *Road Standards* (NPS 1984b) indicate that the traffic loads on Going-to-the-Sun Road would require 12-foot lanes and 3-foot shoulders, with a design speed of 45 mph maximum and 35 mph minimum. Lanes and shoulder widths along Going-to-the-Sun Road are narrower and do not meet these standards. However, the *Road Standards* caution that "basic decisions will have to be made by park management in the application of these standards based on careful examinations of the desired use levels to be allowed considering impacts on visitor use and resource protection in conformance with legislative mandates."

In addition to the issues that require analysis of a public transit system, Going-to-the-Sun Road is in need of repair. The road was constructed in the 1920s and early 1930s, and except for an asphalt overlay and normal maintenance, it has not been redesigned or rebuilt since the original project. The pavement is deteriorating due to heavy traffic loads and its age and condition, and the pavement edge is subject to cracking or failure because of a lack of support at the road shoulders. A combination of moisture problems and inadequate base materials results in deformation of much of the lower sections of the road. Subsurface runoff and snowmelt in combination with a poor or nonexistent ditch section cause moisture problems. In addition, subsurface moisture from the slope below the ditch is transmitted into and under the roadway section. This subsurface moisture problem is exacerbated by fine-grained soils that have a high potential for capillary action. The end result of these problems is that water saturates the road base during most of the year. In the winter, this water freezes, expands, develops ice lenses, causes the road surface to heave, and eventually breaks up the road. Differential settlement and frost heave is severe

MAPS

TRANSPOSED TO

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in some areas, causing profile and cross-section distortion. Repeated patching has left the road surface uneven, which increases maintenance costs and diminishes visitor enjoyment.

The Logan Pass section of the Going-to-the-Sun Road is narrow (18 to 23 feet), with occasional rock outcroppings protruding into the driving lanes. Sections of stone parapets need repair or replacement with guardrails because the stone work is low and/or tilted from avalanches. Portions of the roadway, drainage structures, and roadway prism are in poor condition and in need of repair or reconstruction. In some portions of the road, the shoulder is inadequate and erosion is continuing to reduce the shoulder width.

A number of turnouts have been created on Going-to-the-Sun Road for lake access, scenic viewing, wildlife viewing, and trailhead use. Sight distances are often inadequate for safe turning into traffic because of regrowth of vegetation on the roadcuts since original construction and the fact that the turnouts were not planned for large recreational vehicles. Another problem is that some of the turnouts are on the opposite side of the road from the scenic attraction, causing visitors to cross the road to reach their destination. Most of the turnouts should be redesigned to improve safety, provide acceleration and deceleration lanes, and improve parking; turnouts on blind curves or hills should be eliminated. In addition, formalized wayside exhibits and visitor use areas should be provided to consolidate the impacts of visitor parking on sites hardened for the purpose and designed to accommodate the larger vehicles now in use.

With the passage of the National Surface Transportation Assistance Act of 1982, Congress recognized a nationwide need for rehabilitating and upgrading deteriorating road systems in national parks and on national parkways. Going-to-the-Sun Road and other major park roads can be rehabilitated under this program. The Federal Highway Administration (FHWA) has prepared a *Road Rehabilitation Planning Study* (FHWA 1984) that supplies project-oriented information and a range of alternatives for correction of road deficiencies for Glacier National Park. This study has been used in the transportation planning effort to decide what will be done about the deteriorating portions of the park road system.

A number of issues have been raised in the past few years that could be resolved or ameliorated by a park public transit system. These issues are as follows:

> Going-to-the-Sun Road is receiving increasing use by large buses and motor homes as well as bicyclists. Because roadway width generally ranges from 18 to 24 feet, there is insufficient lane space for large vehicles to pass each other or to pass bicyclists. These safety problems are exacerbated by visitors' wishes to enjoy the beautiful scenery, which distracts many drivers and causes others to stop or cross traffic. Additional size restrictions on vehicles may be necessary, but this would be difficult to initiate without a public transportation system.
>
> Going-to-the-Sun Road is intimidating to many visitors not familiar with mountain driving and/or the high levels of traffic frequently encountered on this road. Many of these individuals would prefer to leave their vehicles and ride a bus. Additionally, those familiar with mountain driving might also prefer or welcome the opportunity of a guided bus tour.
>
> Hikers arrive at the park's entrances on foot and desire public transportation to trailheads. Other visitors leave their vehicles in trailhead parking lots and either exit the backcountry many miles from their vehicles or must return on the same trail.

Glacier Park, Inc. (GPI), a concessioner, owns and operates the only park bus system. The concessioner provides transportation in the historic red-painted White buses for GPI overnight guests and tour groups, and as such has a limited schedule that does not meet the needs of the other park visitors. Numerous other tour buses arrive at the park from several destinations, but the large size of most of these buses prohibits their use on the Logan Pass segment of Going-to-the-Sun Road.

Several public transportation modes deliver visitors to the vicinity of the park. Amtrak has stops at East Glacier and West Glacier, one major airline services Glacier Park International Airport near Kalispell, and a bus line has a Montana franchise to transport passengers to West Glacier. However, park visitors brought by these public conveyances must take taxis or limousines or rent cars at the airport or local communities to tour the park. In addition, numerous lodging accommodations, restaurants, and convention centers have been developed over the past few years (see the "Affected Environment, Region" section for details). A need for public transportation between these facilities and to Glacier National Park has arisen. Local public transit systems will be developed in the near future. It will then be desirable to coordinate regional and park public transportation systems to facilitate movement of visitors to and within the park.

A traffic capacity and visual analysis of Going-to-the-Sun Road was carried out in August 1984. Although the analysis indicated that the roadway had not yet reached its traffic carrying capacity (there was no substantial stop-and-go driving), the traffic was moving 10 to 15 miles per hour below the posted speed limits.

The 1984 analysis also indicated that at four sites along Going-to-the-Sun Road and in the Apgar area, parking demand exceeded the capacity of existing spaces. The Logan Pass parking area was the most congested area, being at capacity on weekends in July and August from about 10:00 a.m. to 4:30 p.m.

All road, public transit, and traffic management issues have been considered in developing and analyzing alternatives for the transportation plan.

PLANNING APPROACH AND SCOPE

The information contained in this document reflects several successive phases in the planning process. During the first phase the range of issues and objectives to be addressed in the transportation plan were identified, and existing facilities and visitor use patterns were analyzed. Next, the most reasonable ways of resolving issues and meeting objectives were considered. Four alternatives, including a no-action and a draft preferred alternative, were developed that proposed actions for rehabilitation of the Going-to-the-Sun Road, implementation of a public transit system, and traffic management. Treatments for Packers Roost and Camas roads, the Sun Point intersection, and 130 turnouts on Going-to-the-Sun Road were included in each alternative. All alternatives were analyzed to determine their beneficial and adverse effects and their cumulative impacts on known cultural resources. This analysis and subsequent public review and comment on the *Draft Transportation Plan/Environmental Assessment* will provide the basis for selection and development of a final transportation plan.

Section 1 of Going-to-the-Sun Road from the west entrance to the T-intersection of the Camas and Going-to-the-Sun roads was improved in a separate project, completed in 1983.

The portion of Going-to-the-Sun Road from 0.55 mile east of the Camas Road intersection to the intersection of the Lake McDonald ranger station road (section 2) was considered separately because immediate funding was available for that portion (NPS 1985b). This transportation plan covers all other rehabilitation and reconstruction projects along Going-to-the-Sun Road.

Treatments for 130 turnouts and the rehabilitation and reconstruction of Camas Road, Packers Roost Road, and Sun Point Road have been included in this document. However, it may be necessary to prepare further documentation of environmental impacts when design details are available.

Alternatives to other major park roads (Many Glacier Road, Two Medicine Road, Chief Mountain Highway) are not presented in this report because further geotechnical and planning studies are required before formulation of specific road options. Road options for the North Fork area will be analyzed in the development concept planning effort currently underway. The North Fork Road will not be changed in character or condition. Because the Cut Bank Road is in generally good condition, no actions other than normal maintenance are proposed during this planning effort.

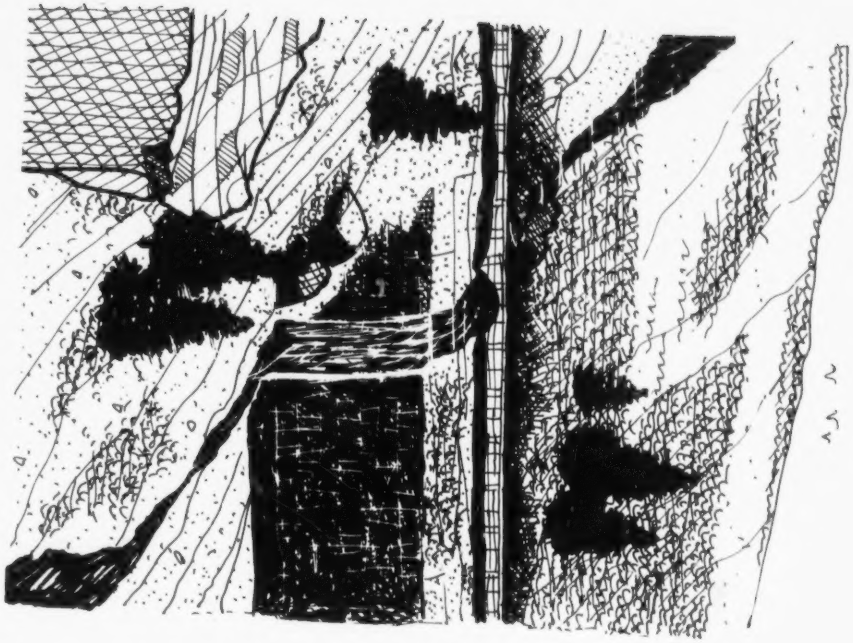
The North Fork loop road proposal first made in the 1950s is no longer viable because of resource preservation considerations. A loop road over Akamina Pass might reduce the nondestination park traffic and commercial travel on Going-to-the-Sun Road between the Lethbridge area and the Flathead Valley. However, traffic congestion would probably be reduced only slightly because although 13 to 17 percent of park users in recent years have been from Canada, a 1984 exit survey showed the great majority of these users were park visitors. Construction of this loop road could encourage private development along State Route 486 (North Fork Road). Additional pressure would develop to pave route 486 and to provide additional service in the North Fork area. This increased development, both residential and commercial, would bring more people into the undeveloped North Fork area, which would probably increase visitation and demands on NPS facilities. Encroachment and potential degradation of the wildlife habitat and ecological system in the North Fork area would result. There would be an increased potential for greater conflicts between grizzly bears, gray wolves, and humans, eventually leading to a reduction in the range/space for wildlife species. The increase in visitation would also diminish the existing "wilderness-type" visitor experience. This project has been publicly opposed by Waterton National Park in Alberta, Canada.

Regional tourism groups have been promoting the creation of a parkway that would connect American and Canadian national parks in the Rocky Mountain region. The parkway, which is sometimes referred to as the "Trail of the Big Bear," would most likely be designated along the existing US 89 corridor in the United States. The route would parallel Glacier's eastern boundary. The intent of the parkway would be to attract tourists and provide for their needs while protecting natural and cultural resources of the region. Going-to-the-Sun Road would be a primary access route to the parkway. Regional highway planning is considered beyond the scope of this planning effort; therefore, the parkway concept is not addressed in the transportation plan.

Bicycles are a popular means of conveyance on Going-to-the-Sun Road and other park roadways. The level of bicycle use on park roads does not comprise an appreciable percentage of the total traffic volume on these roads. However, there is currently a lack of accurate data on the existing volume and distribution of bicycle use in the park. Therefore, a systematic and comprehensive analysis of bicycle use will be conducted at the earliest possible opportunity (in consideration of available funding and staff). After completion of the analysis, a bicycle management plan will be developed for the park and will become part of the final transportation plan.

This *Draft Transportation Plan/Environmental Assessment* will be made available for public review and comment for 30 days. During the review process the Park Service will also be seeking information regarding the significance of park roads to the visitor experience. An input form will be mailed with each copy of the document and document summary, and copies of the form will be available at various locations in the park during the 1989 visitor season. All public comments on the draft plan alternatives and the visitor experience form will be considered during formulation of the final transportation plan. Following full public review and comment, it will be determined whether an environmental impact statement will be prepared.

Additional copies of this document can be obtained by writing the Superintendent, Glacier National Park, West Glacier, Montana 59936.



AFFECTED ENVIRONMENT

REGIONAL AREA

Glacier National Park is bordered on the north by the Canadian provinces of Alberta and British Columbia. The Montana counties of Glacier and Flathead extend into the Continental Divide within the park from the east and west, respectively. This forms the immediate region surrounding the park; however, Flathead County and Alberta Province provide the greatest number of regional park visitors. A variety of tourist accommodations and some public transportation facilities are provided for more distant travelers. Glacier County has some visitor accommodations along the east side of the park and limited public transportation. British Columbia has tourist and transportation facilities, but the vast majority of their recreation populace visits the Canadian provincial and national parks within the province (5 to 10 percent of Glacier's Canadian tourists are from British Columbia). As a result, this analysis will focus on the two Montana counties and Alberta Province.

REGIONAL LAND USE

Flathead County, one of the largest counties in Montana, contains 3.4 million acres. Only 824,000 acres are in private ownership. Most of the remaining acreage is in Glacier National Park and three national forests, including Flathead and Lewis and Clark adjacent to the park. The state owns 133,000 acres, and there are relatively small tracts of tribal lands and U.S. Fish and Wildlife Service areas. The Forest Service lands are mainly managed for timber harvesting and recreation, and the private areas are used primarily for range and croplands.

Glacier County is primarily composed of the eastern half of Glacier National Park and the 900,000-acre Blackfeet Indian Reservation. The only consolidated acreage of private land is a fairly narrow strip on the east side of the county. Excluding the park, about half the county is open rangeland. The other major use is cropland, a small but growing portion of which is under irrigation. A growing number of oil and gas wells are interspersed with other land uses.

Approximately 75 percent of southwestern Alberta Province (Oldman River region) is made up of prairie. The prairie is interrupted by river valleys, and the Rocky Mountains delineate the extreme western portion of the region. Extensive public lands in the form of wilderness areas; national (Waterton Lakes National Park), provincial, and local parks; commercial forests; and recreation areas are situated in the mountains. The Blood Indian Reserve occupies the south-central segment of the region, the Blackfeet Indian Reservation is at the northern tip, and the rest of the prairieland is primarily utilized for rangeland, dryland farming, and, to a lesser extent, irrigated farming.

REGIONAL ECONOMY

General Description

The economy of Flathead County is based primarily on wood products, manufacturing, tourism, and government. The wood products industry is the major economic activity in the county, but the aluminum refinery in Columbia Falls is the largest employer in the area and supplies over one-third of county taxes. Tourism contributes significantly to employment and the local economy. However, its input to the economy has been somewhat less because of a preponderance of low paying, part-time, and seasonal positions. As tourism increases in Flathead County (see the following section) it will undoubtedly constitute a greater percentage of the county's economy. Agriculture is not a major industry in terms of earnings or personal income, but the many small farms contribute substantially to the rural lifestyle enjoyed by local residents.

The economy of Glacier County is based primarily on wood products, a growing oil and gas industry, agriculture, government, and tourism. The major industries of the Blackfeet people are ranching, farming, and tourism, and they are currently interested in oil and gas development.

Agriculture is the mainstay of the Oldman River region economy (see the Regional Setting map). It is by far the predominant land use; croplands, hay production, and pastures occupy most of the land area. Retail trade and recreation form lesser components of the economy. The oil, gas, and coal industries were once a major component of the regional economy; however, these interests are experiencing a steady decline and are not expected to be a significant portion of the long-term regional economy.

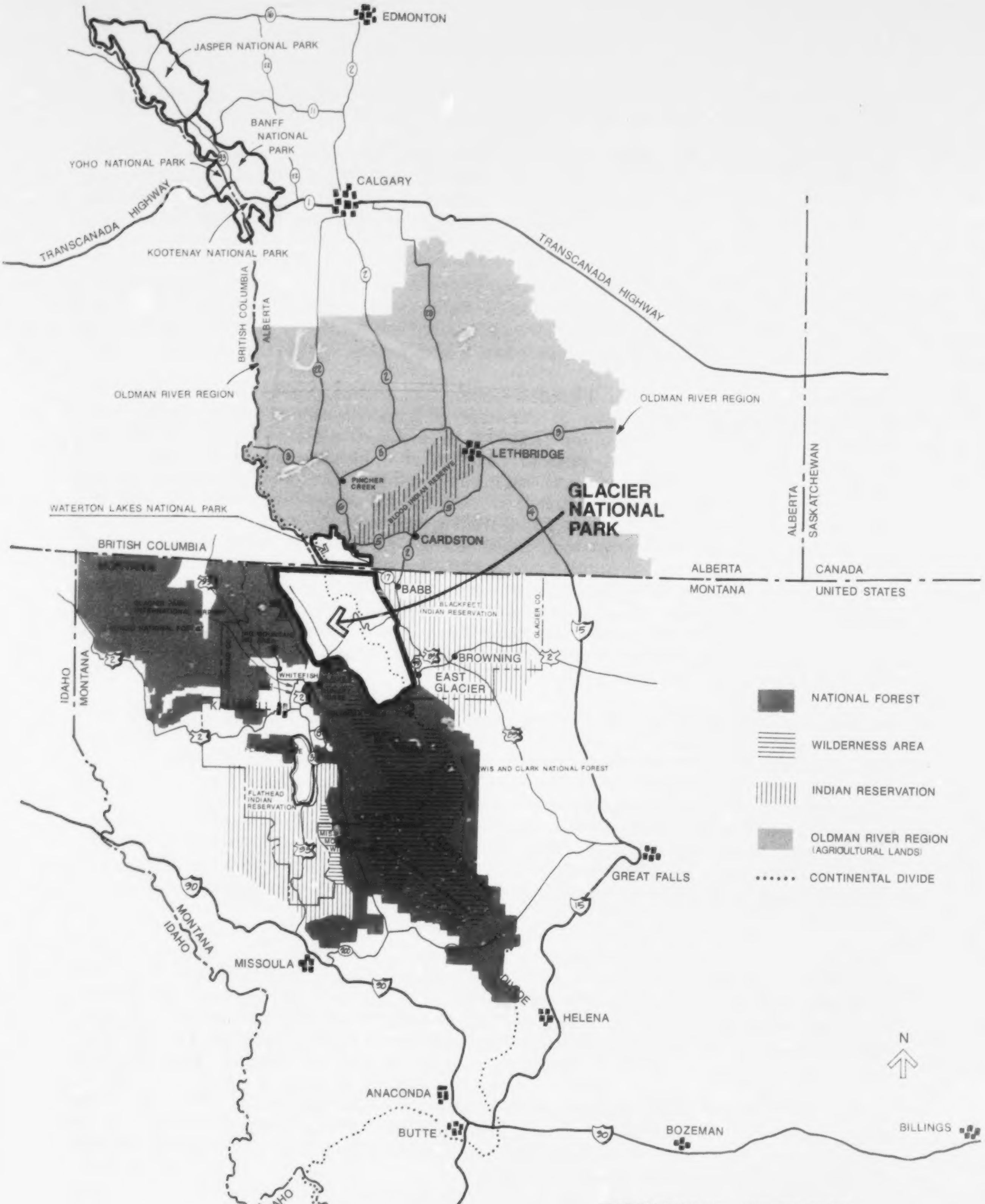
Tourism

The northeastern portion of Glacier National Park is contiguous with Waterton Lakes National Park in Canada, and together these parks form the Waterton-Glacier International Peace Park. Waterton-Glacier is the core of a vast mountain recreation complex in northwestern Montana and Alberta and British Columbia provinces that follows the Continental Divide and includes three U.S. Forest Service wilderness areas (Bob Marshall, Great Bear, and Mission Mountains), the Flathead River, four Canadian national parks, and a variety of provincial parks, wildernesses, and recreation areas. Several Alberta provincial parks are immediately north of Waterton Lakes National Park, and the Big Mountain ski area and Flathead Lake are major tourist attractions in Flathead County in the vicinity of Glacier National Park.

Glacier National Park attracts visitors from Montana, the United States, and many foreign countries. A 1984 visitor survey found that 89 percent of park visitors were from the United States (16 percent of the visitors were from the state of Montana). Foreign recreationists accounted for 11 percent of total park visitation. Over two-thirds of foreign visitors were from Canada, while another 27 percent were from European countries. The median age of visitors was 28 years. Nearly 80 percent of the visitors were under the age of 40, with only 3.7 percent over 65 years old.

Glacier National Park supports a wide variety of recreational activities. Among the most popular activities are sightseeing, photography, hiking/walking, camping, and backpacking. The state of Montana has recently been engaged in a proactive campaign to attract tourists to the state. The initiative has included the production of television commercials, which have been supported by advertisements in various regional, travel, and special interest magazines and in major city newspapers. Many of the promotions have featured Glacier National Park as one of the state's special attractions.

Visitation to the Canadian Four Mountain Parks (Banff, Jasper, Yoho and Kootenay) increased by about 25 percent between 1970 and 1980 but declined slightly from 1981 to 1986. Visitation to these parks has again been on the increase since 1986. Use of the southwestern Alberta provincial parks has been increasing on a regular basis and, according to regional projections, such use is expected to continue to rise. Visitation to both


EDMONTON
JASPER NATIONAL PARK
BANFF NATIONAL PARK
YOHO NATIONAL PARK
CALGARY
TRANSCANADA HIGHWAY
KOOTENAY NATIONAL PARK
TRANSCANADA HIGHWAY
BRITISH COLUMBIA
ALBERTA
OLDMAN RIVER REGION
OLDMAN RIVER REGION
LETHBRIDGE
PINCHER CREEK
BLOOD INDIAN RESERVE
WATERTON LAKES NATIONAL PARK
GLACIER NATIONAL PARK
CARDSTON
ALBERTA
SASKATCHEWAN
BRITISH COLUMBIA
MONTANA
ALBERTA
MONTANA
CANADA
UNITED STATES
BABB
BLACKFEET INDIAN RESERVATION
GLACIER CO.
BROWNING
EAST GLACIER
WHITEFISH
IDAHO
MONTANA
LEWIS AND CLARK NATIONAL FOREST
FLATHEAD INDIAN RESERVATION
GREAT FALLS
MONTANA
IDAHO
MISSOULA
DIVIDE
HELENA
ANACONDA
BUTTE
BOZEMAN
BILLINGS
IDAHO
BOISE
N
NATIONAL FOREST
WILDERNESS AREA
INDIAN RESERVATION
OLDMAN RIVER REGION (AGRICULTURAL LANDS)
CONTINENTAL DIVIDE
16
2
22
11
93
1
2
23
22
2
3
5
6
5
4
2
17
89
2
15
2
89
93
90
15
90
200
90

REGIONAL SETTING

GLACIER NATIONAL PARK/MONTANA

UNITED STATES DEPARTMENT OF THE INTERIOR/NATIONAL PARK SERVICE

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MILES

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DCS | JUNE 87

Glacier and Waterton Lakes national parks has exhibited steady growth over the past 20 years, but both parks seemed to reach a plateau in use by the mid-1980s.

Tourism at Glacier is expected to level off or increase at a modest annual rate of 1 to 1½ percent over the next 20 years (see the "Affected Environment, Socioeconomic Environment/Visitor Use, Park Visitation" section). The staff at Waterton Lakes feels that park visitation will continue to decrease or level off for the next few years because of higher park user fees.

The Big Mountain ski area in Flathead Valley is one of Montana's most popular ski resorts and also attracts large numbers of skiers from the Canadian provinces of Alberta, Saskatchewan, and Manitoba. In addition, approval of the resort's master plan by the U.S. Forest Service will see existing facilities more than doubling in the next decade.

This strong growth in tourism in Flathead County has encouraged further development in a diversity of recreational facilities in the valley. Significant condominium, vacation, and retirement home developments in the Whitefish and Kalispell areas have occurred over the past two decades and are expected to continue at a healthy rate. A number of golf courses, tennis courts, swimming pools, restaurants, lodging accommodations, and sporting goods stores have also been constructed to meet the increased tourist demand. Package tours offering vacation experiences such as rafting and western frontier outings are being provided by some of the major local businesses. The town of Kalispell has recently completed a shopping mall/convention center complex to attract large business groups and tourists, and the town of Whitefish has a plan for a similar type development. The Whitefish Mall has been completed. Other recreation-related facilities are also being constructed to further support the tourist and travel industries. Development of such a diversity of accommodations and vacation experiences provides a strong base to attract visitors to Flathead County and the state.

The tourism and travel industries in Flathead Valley contribute significantly to the local economy and constitute a major portion of the statewide travel industry. As a result the Montana Department of Commerce actively promotes the park and the ski area to attract out-of-state tourists to Montana. The program has been quite successful and tourism to the state has increased 9 percent over the past three years. This is a surprising rate of increase because Canadian tourism to Flathead Valley has dropped off because of the poor Canada/U.S. money exchange rate and the decline in the Canadian economy. However, this loss in Canadian tourism has been more than offset by an increase in domestic travel. It seems likely with this type of program in place that travel and tourism to Montana, especially Flathead Valley, will continue to increase.

Tourism development in Glacier County has been less dramatic. The Blackfeet Indian Reservation has two museums – the Plains Indian Museum (operated by the federal government) and the Museum of Montana Wildlife. They own and operate the Chewing Blackbone and Duck Lake campgrounds several miles north and northeast of St. Mary, respectively. The Blackfeet have also recently acquired the KOA Campground in St. Mary and are looking at the option of developing a major downhill ski area at Divide Mountain (7 miles south of St. Mary). A few improved recreational facilities are planned along the eastern park boundary and throughout other portions of the reservation. The town of St. Mary has several privately owned lodging and restaurant facilities and gas stations that are used by park visitors in the summer months. Restaurants and/or gas stations are also present in Babb, Browning, and East Glacier.

REGIONAL POPULATION ANALYSIS

Flathead County's population currently exceeds 56,800 (1985) following more than four decades of strong growth. The last decade (1970-1980) produced a 32 percent increase, but according to local officials this is expected to taper off somewhat to an approximate 2 percent per year growth rate through the year 2000. Of the three major towns in Flathead Valley, Columbia Falls has evidenced the greatest amount of growth with a 17 percent increase from 1970-1980. Whitefish has shown significant population increases over the past two decades, 13 percent from 1960-1970 and 7 percent from 1970-1980; however, the surrounding residential areas have undoubtedly increased at a more rapid rate than indicated for the city. The population of Kalispell exhibited steady population growth from 1940-1970, but this dropped off to a loss of 2.2 percent for the 1970s.

The population of Glacier County amounted to approximately 11,500 in 1985. Recent decades have recorded little growth, and no major population increase is projected for the foreseeable future. The population density is only one-third that of Flathead County.

The population of Alberta Province is approximately 2.2 million and the Oldman River region contains 150,000 people. An annual average growth rate of 2.4 percent occurred for the region in the 1976-1986 period. A moderate average annual rate of growth for the province and region for the next 15 years is estimated by the Canadian government to be between 1.5 and 2.0 percent.

REGIONAL TRAVEL

Highways and Roads

Major highways leading to the park or local area are Canadian highways 2, 5, and 6 from Calgary and Edmonton, Lethbridge, and Pincher Creek, respectively. Trans-Canada Highway and US 2 provide access to and near the park from the east and west, US 89 serves the east side of the park from Great Falls, US 93 and Canadian routes carry traffic from British Columbia and Missoula, and MT 35 and 83 provide access from Missoula. Chief Mountain Highway (MT 17) dips into the northeastern portion of Glacier and leads to Waterton Lakes National Park. Other external roads adjacent to the park include North Fork Flathead River Road (Montana Forest Highway 61 and Flathead County Route 486) along the west side of the park from the Canadian border to Columbia Falls and MT 49 from Canada to East Glacier along the eastern boundary. Interstates 90 and 15 pass within 100 miles of the park and provide major east/west and north/south approaches, respectively.

Significant road construction work recently completed in the park vicinity included the widening of 4.3 miles of US 2 through Columbia Falls and 10.9 miles from Hungry Horse to West Glacier. Canadian Highway 2 from Calgary was widened and resurfaced in 1980, and widening and realignment of some sections of Canadian Highway 5 from Cardston and Lethbridge is scheduled for 1990.

A general unit of measure for traffic on a roadway is average daily traffic (ADT), defined as the total volume during a given time period (24 hours or over). In this report, ADT includes counts on weekdays and weekends for the data collection period for analyzing operating conditions.

Although the annual average daily traffic (AADT) on US 2 between Hungry Horse and West Glacier has fluctuated over the past 45 years, there has been an overall long-term increase in traffic volume. The average daily traffic (ADT) in July 1983, 1984, 1985, and 1986 amounted to 7,271, 7,321, and 7,315 and 7,960 respectively. The 1985 and 1986 figures may be slightly higher than normally recorded for July because of reconstruction of US 2 (construction traffic) west of the park during these two years. This leveling off in traffic has also been a statewide trend in recent years. The Montana Department of Highways projected a 2 to 3 percent average annual rate of increase in traffic for the next 20 years in 1982 (MT Department of Highways 1982). Although the growth trend in traffic has leveled off, the state highway department still maintains this annual estimate for construction purposes.

The 1986 annual summer daily traffic (ASDT – May 1 to September 30) for Canadian Highway 2 connecting with US 89 in the United States was estimated at 1,000, and the ASDT for Canadian Highway 6 connecting with Chief Mountain Highway was estimated at 500. The Alberta transportation officials' projected ASDT for the year 2006 for Canadian highways 2 and 6 is 1,000 and 700, respectively. This amounts to a 43 percent increase on Highway 2 and a 40 percent increase on Highway 6 over existing 1986 volumes.

Public Transportation

Public transportation to the park or nearby vicinity is provided by air, rail, bus, and rental cars. A limited number of visits to Glacier occur by taxi and limousine.

Airlines. The cities nearest the park served by major commercial airlines are Lethbridge, and Alberta, Canada; and Great Falls, Missoula, Helena, and Kalispell, Montana. Because it is close to the park (30 miles), the Glacier Park International Airport near Kalispell receives the vast majority of the park visitor airline traffic. As a result, the analysis will focus on this facility.

Delta Airlines, Horizon Air, and Northwest Airlink are the airlines that currently fly into Kalispell. These airlines provide service to the western states of Montana, Utah, New Mexico, and Washington, although there are connecting flights from other portions of the United States and Canada. Passenger enplanements have increased substantially since 1965. The average annual percentage change increase was 26 percent from 1965 to 1970, 19 percent from 1970 to 1975, 11 percent from 1975 to 1980, and 8 percent from 1980 to 1986. Although passenger air travel has continued to increase over the years, the rate of increase has been declining. As a result of this declining rate, a conservative 2 percent annual rate of increase was used to project air passenger traffic arriving at the airport the remainder of this century and to the year 2006. There were approximately 27,000 passenger enplanements at Kalispell during the summer months (June-September) in 1986 and it is estimated (using the 2 percent annual rate of increase) that there will be approximately 29,000 by 1991 and 39,000-40,000 by 2006. This projected rate and number could be higher if the present rate of increase continues and/or if a travel and tourism boom occurs in the Flathead Valley.

Rental Cars. In 1986 approximately 4,200 passengers destined for Glacier National Park rented vehicles at Glacier Park International Airport (approximately 60 people per day in July and August and 24 people per day in late June and early September). Rental cars are also available at West Glacier. Applying the 2 percent annual rate of increase used for passenger enplanement projections to rental car estimates, it is computed that over 4,600 park visitors will rent vehicles in 1991 and approximately 6,100 in 2006. This is an additional 1,900 tourists that will arrive at the park from the Kalispell airport in the year 2006.

Rail. Amtrak provides passenger rail service to the park at East and West Glacier. Two passenger trains per day stop at these stations – an eastbound train in the morning and a westbound train in the evening. Amtrak ridership for park visitors increased 227 percent over the 11 years from 1976 to 1986. Total number of park passengers arriving by rail in 1986 was 10,994. If this rate of increase continues, approximately 27,000 visitors will arrive at the park by the year 1991 and approximately 77,000 by the year 2006. However, Amtrak officials predict a much more conservative ridership rate of increase of approximately 1.5 percent per year. Projections based on this rate would yield approximately 11,900 train passengers visiting the park in the year 1991 and around 14,600 by 2006.

Buses. Few regional bus lines transport visitors to the local area or provide services within the Flathead Valley. Intermountain Transportation Company, which is staged in Anaconda, Montana, provides daily north-south bus service from Edmonton and Calgary, Canada, to Phoenix, Arizona, and east-west travel from San Francisco and Los Angeles, California, to St. Louis, Missouri. Within Montana, daily buses travel north from the Butte/Anaconda area to Kalispell via Missoula. Brown Lines, Inc., operates out of Whitefish and has a route within the Flathead Valley that includes Whitefish, Columbia Falls, and Kalispell. From western Montana, the bus route heads west through the state of Idaho to Spokane, Washington. In the past, Glacier Park Lines provided a daily bus trip from Great Falls, Montana to East and West Glacier.

Rocky Mountain Transportation holds a Class A scheduled (sole operating) authority to transport passengers between East Glacier and Great Falls, but the authority is not being used at this time. The same company also leases charter buses for use in the local area. These buses on occasion have provided group tours to the park. There are numerous other group tour buses that bring tourists to the park from all over the country and Canada. The park counted 26,992 visitors arriving at the park in 1986 on commercial buses. A total of 42,186 visitors came to the park by public transportation (bus, train, or rental car) in 1986.

SOCIOECONOMIC ENVIRONMENT/VISITOR USE

Park Visitation

The annual visitation figures for Glacier National Park from 1951 through 1988 and percent change for each year are illustrated in table 1. Even though there have been fluctuations in the annual visitation figures for Glacier, the overall trend has been a steady increase from under 1,000,000 visits in 1968 to 1,817,733 in 1988. Since 1976, visitation has stabilized as at other remote national park units. This can, to some extent, be attributed to trends in national economics. Motor fuel problems, an issue through 1984, have since been alleviated.

Visitation to Glacier leveled off at approximately 1.5 million between 1983 and 1987. However, in 1988, the park recorded its highest annual visitation of 1,817,733. It is currently not possible to ascertain if this large increase is an anomaly or an indication of a new upward trend in visitation. It is possible that some of the increase can be attributed to changes in travel and recreation plans that were created by the extensive forest fires in western states during 1988.

Table 1: Comparative Visitation Figures (1951-1988)

Year	Visits	Percent Change Over Previous Year
1951	496,142	+ 2.9
1952	649,689	+30.9
1953	633,480	- 2.5
1954	608,200	- 4.0
1955	674,100	+10.8
1956	718,938	+8.6
1957	759,161	+ 5.9
1958	706,841	- 6.9
1959	722,338	+ 1.4
1960	724,538	+ 0.3
1961	739,382	+ 2.3
1962[1]	966,100	+31.0
1963	811,214	-16.0
1964[2]	642,100	-21.0
1965	847,114	+32.0
1966	907,839	+ 7.2
1967	884,049	- 2.6
1968	964,493	+ 9.1
1969	1,051,165	+ 9.0
1970	1,241,603	+18.2
1971	1,303,073	+ 4.9
1972	1,392,145	+ 6.8
1973	1,398,958	+ 0.4
1974[3]	1,406,643	+ 0.5
1975	1,571,393	+11.7
1976	1,662,678	+5.8
1977	1,656,212	- 0.3
1978	1,601,131	- 3.3
1979	1,446,236	- 9.6
1980	1,475,538	+ 2.0
1981	1,786,843	+21.0
1982	1,666,431	- 6.7
1983	1,555,717	- 6.6
1984	1,580,935	+ 1.6
1985	1,524,585	- 3.6
1986[4]	1,579,191	+ 3.6
1987	1,660,737	+ 3.2
1988	1,817,733	+9.5

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[1] Seattle World's Fair Year
[2] June Flood Year
[3] Spokane Expo Year
[4] Expo 86 – Vancouver

Table 2: Visitation by Entrance Station and Month (1981-1987)

Entrance	1981	1982	1983	1984	1985	1986	1987
West Entrance	683,207	644,786	662,666	610,081	624,882	642,321	636,558
St. Mary	526,092	408,007	214,525	317,242	282,859	390,641	377,486
Chief Mountain	192,625	217,217	266,276	213,088	199,000	211,207	214,050
Many Glacier	190,682	185,428	203,149	158,699	136,683	95,227	180,075
Two Medicine	59,625	65,513	65,248	58,933	62,436	73,387	71,630
Camas	60,111	35,180	49,993	41,625	64,877	25,706	11,167
Polebridge	26,270	27,168	22,689	26,277	23,528	20,948	15,187
Waterton*	30,921	30,543	31,126	40,466	35,850	34,279	31,031
Cut Bank	8,347	3,275	4,676	5,262	6,361	6,410	13,803
Walton	8,963	49,314	75,369	109,262	88,109	78,065	110,020

Month	1981	1982	1983	1984	1985	1986	1987
January	8,974	5,378	4,956	4,309	3,306	5,442	6,561
February	8,288	5,468	5,158	6,014	3,771	3,725	7,118
March	15,493	9,781	8,568	8,416	8,160	10,192	8,354
April	26,814	20,045	19,649	24,457	10,921	26,049	29,332
May	75,927	57,561	67,869	50,477	71,565	91,032	88,708
June	260,437	237,605	220,805	263,713	271,655	270,600	282,364
July	571,342	529,902	494,551	516,180	487,859	465,816	501,229
August	510,275	513,592	486,352	452,539	423,142	459,919	436,118
September	202,036	196,936	191,986	177,813	142,337	148,825	200,384
October	61,352	65,243	46,611	52,893	61,381	71,771	67,647
November	37,984	18,772	28,115	18,843	36,941	18,347	25,070
December	7,921	6,148	4,168	5,168	3,480	7,473	7,872

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*Not in study area

Over the past 20 years, Glacier recorded an increase in visitation of 87.9 percent, a relatively high rate of increase when compared to some of the larger well-known parks inthe west and southwest: Grand Canyon (94.6 percent), Yellowstone (16.4 percent, not including 1988), Yosemite (40.5 percent), and Grand Teton (-45.1 percent).

Table 2 shows park visitation by entrance station and month from 1981 through 1988. The large increase at Walton is mainly due to the development of the Goat Lick overlook near Walton in 1981. The decrease at the St. Mary entrance since 1981 has reversed itself; the visitation amounted to 434,514 in 1988. In 1986, Many Glacier recorded the lowest visitation since 1981, but rebounded significantly in 1987 and 1988.

The monthly trends identify that July is the highest use month closely followed by August, and that December, January, and February are the lowest use months. The monthly visitation levels are very important in projecting potential public ridership for a visitor transportation system.

Glacier visitation increased dramatically from the mid-1960s to the mid-1970s and basically leveled off since the mid-1970s. If the last 10-year trend, excepting trends for 1988, continues into the future, park visitation will remain at approximately 1,600,000. Based on Montana and national trend forecasts and national forecasts for recreational visits to national park units, Glacier visitation may potentially increase 20 to 30 percent over the next 20 years (1,900,000 to 2,050,000 annually by year 2007). These forecasts assume continued stability in the economy and the continued availability of motor vehicle fuels.

Table 3 shows comparative visitor origins to Glacier in 1951 and 1984. In 1951, Montana and Canada accounted for a combined 39.9 percent of total visits. Other domestic locations accounted for 60 percent of visits and other foreign countries for 0.1 percent. By 1984, the proportion of Montana/Canada visits had decreased to 23.6 percent, while other domestic visits had increased to 72.8 percent, and other foreign visits had increased to 3.6 percent. These figures seem to suggest an increase in the national and international popularity of Glacier.

Table 3: Comparative Visitor Origins, 1951 and 1984

Location	**1951**	**1984**
Montana	23.3%	16.3%
Other USA	60.0%	72.8%
Canada	16.6%	7.3%
Other Foreign Countries	0.1%	3.6%

*1984 was used in order to be consistent with ADT comparisons

Campground Use/Concession Lodging

Persons staying in campgrounds and lodging in the park may be potential passengers on a visitor transportation system.

Figure 1 shows average and peak day use of campground facilities in the park for July 1984. Due to the high visitation levels during July, average day use of campgrounds was nearly as high as peak day use. On many evenings during July and August, many of the campgrounds are filled to capacity.

Figure 2 shows the number of rooms and the pillow count for lodging facilities and the number of concession employees residing in the park by location.

CULTURAL ENVIRONMENT

Archeological Resources

There has been no comprehensive survey of Glacier National Park for archeological resources called for by EO 11593, "Protection and Enhancement of the Cultural Environment." None of the archeological sites discovered in the site-specific surveys performed to date would be affected by any of the alternatives proposed. Before any ground-disturbing activities were undertaken, an archeological resources inventory would be taken on any unsurveyed areas where land modification was planned. The inventory would include an assessment of the need for monitoring. Excavation in areas where underground archeological resources may exist is subject to archeological clearance and would be monitored by a qualified archeologist. If archeological resources were discovered during construction, work would be suspended until a qualified archeologist could evaluate the remains.

Historic Resources

The portion of Going-to-the-Sun Road from the Camas Road intersection at the foot of Lake McDonald to the eastern park boundary at St. Mary is listed on the National Register of Historic Places. The road is important not only for its engineering qualities but also for its representation of the conversion of tourism in Glacier from a rail-based to an auto-based mode of transportation.

Most of the road follows the original alignment, the initial phase of which was completed in the 1920s. The entire road was officially opened in 1933. The two-lane asphalt paved road crosses a number of creeks over stone-faced bridges, passes through two tunnels and between a series of stone retaining walls, all of which are features that contribute to the historical significance of Going-to-the-Sun Road. The rubble-masonry stonework at several of the culvert headwalls and bridges is original. Section 5 of the road contains "C" sections (rock incisions into the near-vertical to overhanging cliff faces) that are also part of the original construction. These construction features help to display the Park Service's early concern with craftsmanship and also harmonize the works of man with the environment.

Figure 1: Campground Use July - 1984

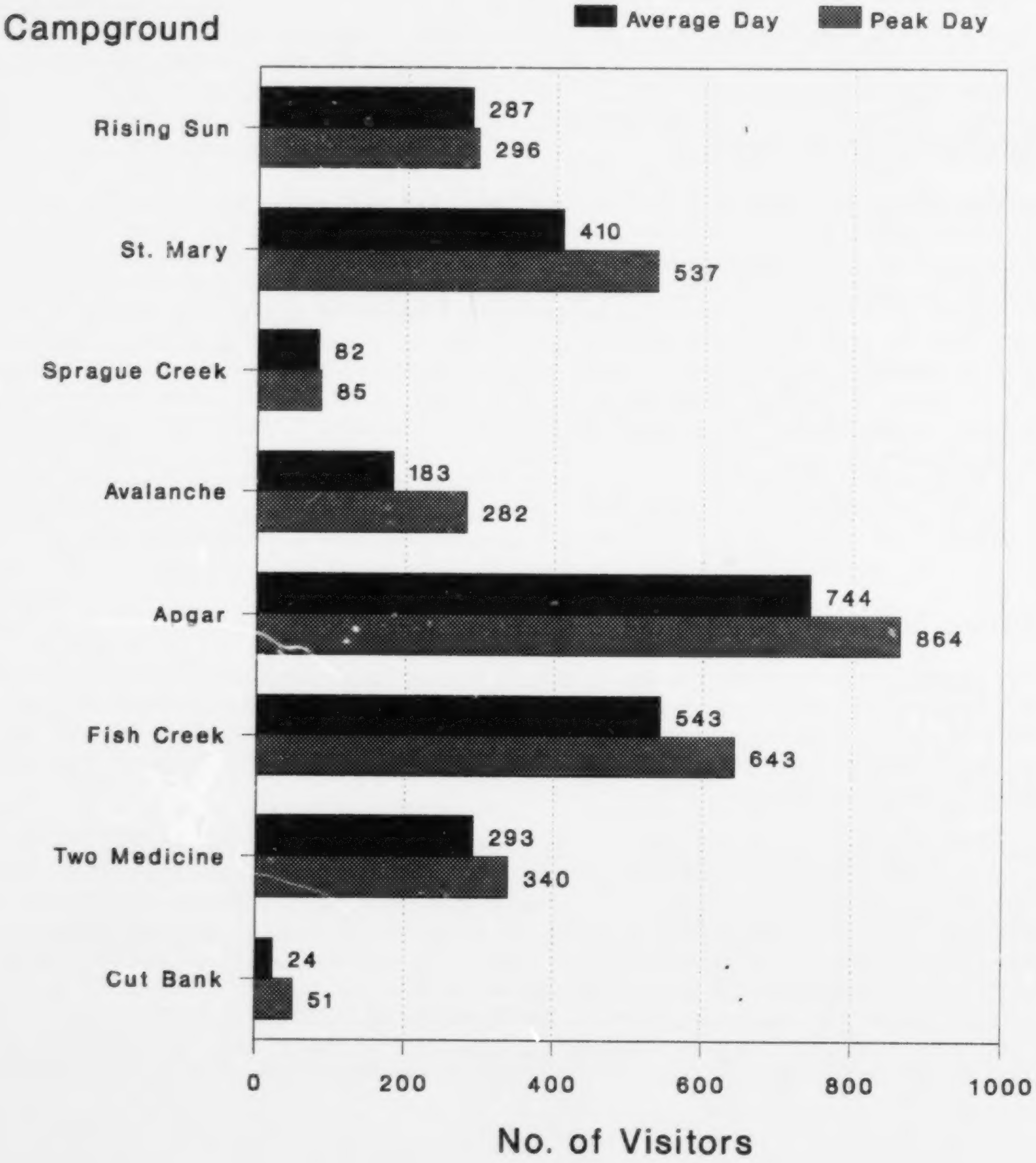
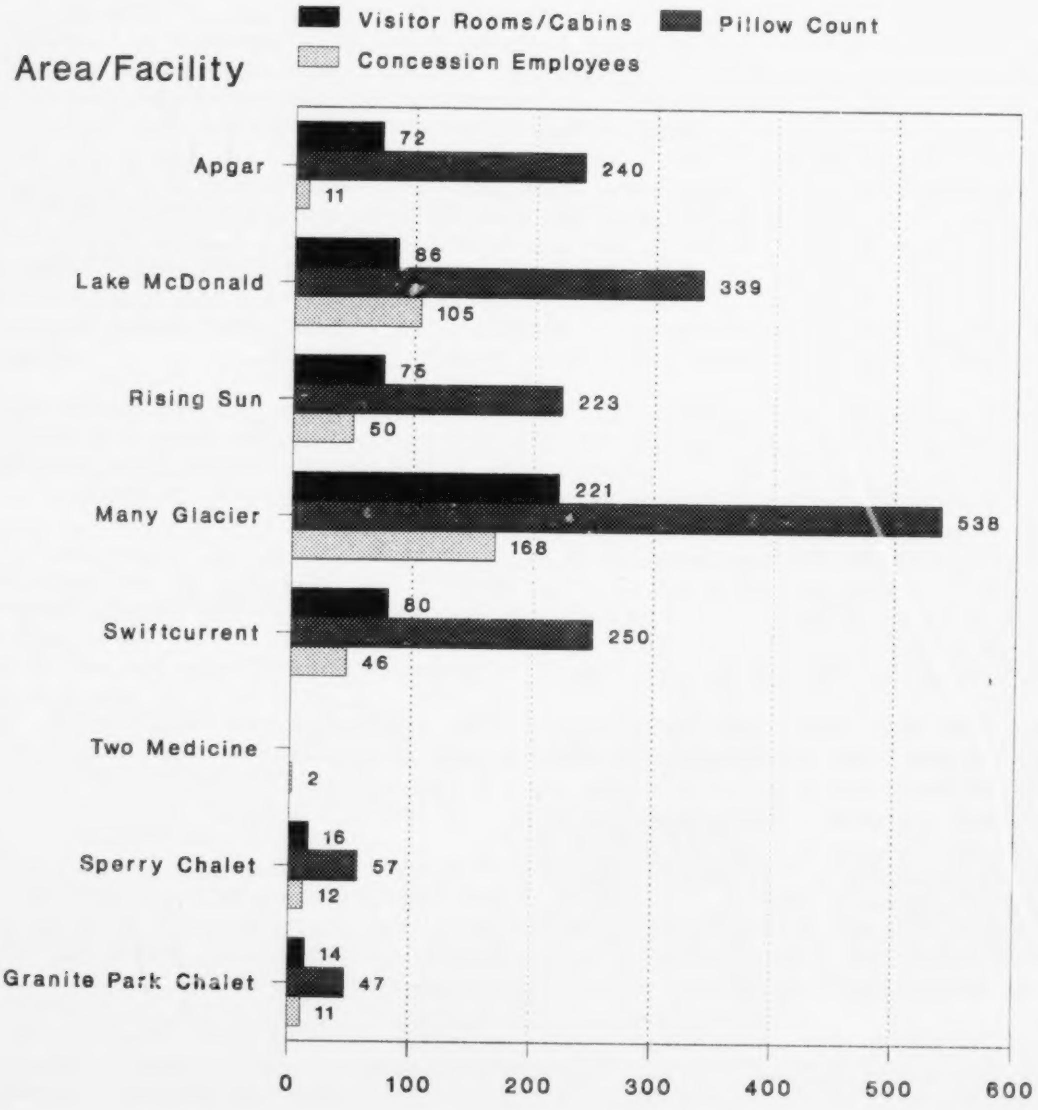


Figure 2: Lodging for Visitors and Concessions Employees in the Park



A report prepared by Dennis Holden for the National Park Service in 1984 said:

> The construction of Going-to-the-Sun Road was an expensive, arduous and dangerous undertaking. Methods were dictated by the technology of the era, but more often by the severity of the topography. Often hand labor and explosives were the only resources available until sufficient track was obtained to allow access to power shovels, compressors, and trucks. Furthermore, intensive mechanization of the effort was discouraged by the National Park Service and Bureau of Public Roads in an effort to minimize the impact of construction on the corridor through which the road was built.

More detail on the road's history can be found in the *Cultural Resource Plan, Going-to-the-Sun Road* (NPS 1989). That plan also describes the unique qualities of the road by segment. Goals for preservation and premises to govern future road activities are also included, as are solutions for masonry problems, guard wall standards, and plowing operations. Both the *Cultural Resource Plan* and this document have identified the need for a comprehensive condition survey for Going-to-the-Sun Road that would include large-scale photogrammetric mapping of walls and stone masonry guardrails along with a detailed on-site inspection to identify, measure, and quantify subsidence, loss of footing support, tipping, bulging mortar, stone deterioration, and any other visible defects. This survey would be used as a benchmark. Periodic monitoring and remeasure would be used to identify problems, to monitor their development, to facilitate programming of funds for repairs, to effect repairs before life-threatening or irreparable damage to historic structures occur, and to provide a continuing historic record of the facilities.

There are several bridges and tunnels that retain much of their historic character. Avalanche Creek is bridged (milepost 16.18) by a three-span, stone-faced, concrete-slab bridge. The bridge, built in 1935, is 27 feet wide, with 4-foot sidewalks on both sides, and 58 feet long. There are stone parapets, and the bridge is in good condition.

The Logan Creek Bridge (milepost 20.63) was constructed in the 1920s. The bridge is a two-span, continuous, earth-filled concrete arch, 22 feet wide and 43 feet long. The reinforced-concrete-slab deck has an asphalt surface and 2-foot-4-inch stone-masonry walls. The stub abutments and piers are reinforced concrete faced with stone. The bridge is in good condition; however, it is narrow and has inadequate hydraulic capacity.

The West Side Tunnel (milepost 23.35 to 23.39), constructed from 1926 to 1928, was widened and lined with concrete in 1968. The top of the tunnel is a half circle with a 10-foot radius. The tunnel is 205 feet long, and the concrete deck is 22 feet wide, with 1.75-foot sidewalks on both sides. The tunnel is 18 feet high and is in good condition.

The Haystack Butte Amphitheater Bridge is a single-span, 26-foot-wide reinforced-concrete slab with an asphalt surface. The length is 20 feet, and the rails are rubble masonry, 1 foot 3 inches high on one side and 2 feet 4 inches high on the other. The bridge was constructed in the early 1930s and is in good condition. The reinforced-concrete, full-height abutments are on solid rock and are faced with stones.

The Triple Arches Bridge (milepost 29.68) was built in the early 1930s. The three-span, spandrel-arch half bridge is 50 feet long and 21 feet wide. The two-lane bridge has both 1-foot 4-inch stone parapets and modern timber railings. The three spans are 16 feet 5 inches long with 5-foot rise arches of 11-foot barrel length. The arch barrels support about half the roadway. The abutments and piers are reinforced-concrete faced with rock masonry on a rock foundation. The structure is in good condition. The original retaining wall, 200 to 300 feet west of the Triple Arches Bridge, was recently stabilized. Stabilization included building 310 feet of new concrete retaining wall on the outside of the original retaining wall. The new wall will be faced with native stone.

Construction on the East Side Tunnel (milepost 32.87 to 32.95) was begun in 1931 and completed in 1933. The reinforced-concrete lined tunnel is 408 feet long and 21.5 feet wide, with 1.75-foot-wide sidewalks on both sides. Major reconstruction was done in 1941, and the tunnel is in good condition.

The Sunrift Gorge (Baring Creek) Bridge (milepost 39.35) is an earth-filled reinforced concrete arch bridge. The deck width is 24 feet and there is a 4-foot sidewalk on the right. The bridge has stone facings on the sides and parapets and is in good condition. This 68-foot-long bridge is included in the thematic National Register nomination of "Historic Bridges for Montana," submitted by the state historic preservation office.

Built in 1934, the three-span, concrete-arch bridge at St. Mary (milepost 49.01) is stone-faced. The bridge is 24 feet wide, with 4-foot shoulders on the right. The 141-foot-long bridge has stone parapets and is in good condition.

The Divide Creek Bridge (milepost 49.68) is a three-span, stone-faced, concrete-arch bridge that was built in 1934. The bridge is 52 feet long and 24 feet wide, with a 4-foot sidewalk and stone parapets. The bridge is in good condition, but the channel under the bridge is restricted.

Packers Roost Road is a 10-foot-wide graded road that connects to Going-to-the-Sun Road (milepost 22.13). It is 0.6-mile long and was built in 1926 as a haul road for bringing in supplies and equipment for the construction of the nearby switchback on the Going-to-the-Sun Road. Since completion of the construction, the National Park Service has used the road for access to a staging area for pack trips to the Granite Park Chalet. A log-stringer bridge over Alder Creek was replaced with two culverts and the road was graveled in 1984. Packers Roost Road possesses no distinctive architectural or engineering features. It has no contextual association with the Going-to-the-Sun Road's significant historical themes, and has little historical integrity as the result of the 1984 modifications. Therefore, the National Park Service has determined that it is not eligible for listing on the National Register of Historic Places.

Sun Point Road (Route 211) is a 20-foot-wide paved road that connects to Going-to-the-Sun Road (milepost 39.83). It is 0.26-mile long and was built in 1932 and 1933 to provide access to a chalet that was operated as a lodge by private parties. The chalet ceased operation during World War II and was subsequently razed by the National Park Service. The road now provides access to a parking lot and viewpoint. Sun Point Road has no outstanding architectural or engineering features. Whatever contextual association it may have had with park development has been lost since the chalet, to which it led, was razed. Additionally, the road possesses little historical integrity since it has been widened and paved. Therefore, the National Park Service has determined that Sun Point Road is not eligible for listing on the National Register of Historic Places.

More detail on Going-to-the-Sun, Packers Roost, and Sun Point roads is included in the "Road and Traffic Analysis, Roadway Characteristics" section.

NATURAL ENVIRONMENT

Going-to-the-Sun Road traverses many different areas of the park, ranging in elevation from approximately 3,200 feet at the west-side approach and 4,500 feet at the east-side approach, to a maximum of 6,647 feet at Logan Pass. The road passes through several types of vegetative communities associated with changing elevation, topography, and other growth factors. Accordingly, descriptions of natural conditions along various portions of the road have been divided into three sections: west, pass, and east.

Geology/Topography/Soils

Going-to-the-Sun and Packers Roost roads on the west side of Logan Pass are underlain by moraine material that tends to be a gravelly, rocky soil. Cut slopes from the original Going-to-the-Sun Road construction in the 1920s had persistent erosion and slumping problems on steep slopes until revegetation work was performed by Civilian Conservation Corps crews. The slopes were stabilized by using erosion-control terraces, mesh, and either planting shrubs or improving growing conditions for plant colonization.

The meadows near Logan Pass provide an alpine flower display through most of the summer, and the open quality of the timberline environment enhances alpine views and panoramas. The decomposed-limestone soils at the pass are shallow and poorly developed. Soil formation is extremely slow because of the cool climate and short growing season. Topsoil is only inches deep at best and is immediately confined to the sod and root systems of plants.

The soils at Rising Sun consist of relatively dense, poorly sorted gravel and cobbles mixed with sand, and to a lesser extent, clay and silt. Soils in the St. Mary valley are composed mainly of glacial till interspersed with alluvial deposits. The soils of the valley floor are primarily silty loam and sandy loam. The soils are well-drained, and particle size varies from cobbles to very fine particles. The organic soil mantle is thin, and planting must be supported with additional layers of topsoil.

Vegetation

Vegetation in Glacier National Park consists of several ecological communities. These include grassland communities, bottomland/forest communities, Douglas fir communities, red cedar/Western hemlock communities, Engelmann spruce-subalpine fir communities, and alpine communities. All of these vegetative communities are found in areas of proposed road reconstruction.

The western portions of Going-to-the-Sun Road and all of Packers Roost Road traverse dense forests of stately western red cedar/western hemlock and Douglas fir. Associated species include spruce, western larch, lodgepole pine, and paper birch. Many trees in old-growth stands were not burned by the 1910 and 1929 fires and are 3 to 4 feet in diameter and more than 100 feet high. The typical understory for this forest is queencup beadlily, twinflower, alder, beargrass, and bunchberry. Going-to-the-Sun roadsides have been revegetated by these species since construction was completed in the 1920s. The hemlock and cedar regrowth on the road cuts have reached up to 25 feet in height and are extremely dense.

A number of exotic plant species, including spotted knapweed and oxe-eye daisy, have become established along disturbed roadside areas. Some of these plants are aggressive invaders and are adept at colonizing newly disturbed ground, then spreading out in suitable habitat. The undisturbed forest habitat is resistant to exotic plant invasion because of the lack of sun and competition from established native plants. Newly disturbed areas are susceptible to the establishment of exotic plants because the exotics are better adapted to colonizing disturbed areas than the native plants. Several species including spotted knapweed and oxe-eye daisy have legal designation by the state of Montana as noxious weeds.

The vegetation at the pass is a transition from Englemann spruce/subalpine fir forest to subalpine fir krummholz to alpine tundra. This area is the treeline transition between patches of stunted subalpine fir trees merging into alpine flower meadows. The meadow vegetation produces a floral display that is one of the attractions of the pass from early July, when snowmelt begins to expose the ground, through August. Plant species include glacier lily, Indian paintbrush, common groundsel, aster, heather, creeping sibbaldia, alpine pasque flower, alpine fireweed, alpine bluegrass, and alpine timothy. The growing season is only about 6-8 weeks long due to the late snowmelt and early fall frosts. A subalpine fir tree only three feet tall and 2¼ inches in diameter at ground level may be 50 to 75 years old. Most of the plants found at this elevation are highly specialized for survival in the alpine life zone, and if not unique to the alpine zone, are ecotypically different from closely related plants at lower elevations.

East of the pass near Rising Sun, vegetation consists of spruce-fir forest communities of which Douglas fir is a common component. Most of the lower elevation alluvial fan is grassland and is characterized by Idaho and rough fescue, bluebunch wheatgrass, junegrass, needlegrass, and kinnikinnick. Aspen groves that also contain cottonwood, willow, snowberry, serviceberry, and wild rose are scattered among the grasslands. The aspen groves are found on sites with more moisture and richer soils than the grasslands.

The St. Mary visitor center complex lies in a natural meadow/prairie opening of several hundred acres referred to as St. Mary Flats. The vegetation consists of bunchgrass prairie species, such as rough fescue, Idaho fescue, kinnikinnick, antennaria, pasque flower, and shooting star. Spotted knapweed has become established along roadsides and ditches in the area.

None of the vegetative communities that would be affected by the proposed project are considered unique or rare.

Wildlife

Mammals present on the western side of the pass include moose, elk, deer, fox, coyote, squirrel, rabbit, weasel, black, and grizzly bears. Birds include varied thrush, ravens, gray jays, various woodpeckers, and many species of perching birds.

Wildlife found at the pass includes Columbian ground squirrels, perching birds, and raptors. Mountain goats can be seen on the high slopes visible from the visitor center.

The diversity of vegetation in the Rising Sun/St. Mary area provides excellent forage and cover for many species of mammals. Grasslands along Going-to-the-Sun Road from Rising Sun to St. Mary are considered important winter range for an estimated population of 300 elk. Some whitetail deer use the area on a year-round basis, as do Columbian ground squirrels, badgers, and coyotes. Other mammals including rabbits, ground squirrels, beaver, and muskrats can be found in the area. Black and grizzly bears, mountain lions, bighorn sheep, and mountain goats live in the surrounding mountains.

Going-to-the-Sun Road crosses St. Mary River and several creeks that are used by fish for spawning. These creeks include Avalanche, Logan, Baring, and Rose. Special care would be needed at these locations to prevent siltation that could jeopardize fish-spawning success.

St. Mary Lake contains several native species of fish, including lake and cutthroat trout, mountain whitefish, and burbot. The lake was stocked prior to 1941, and the nonnative species introduced were brook and rainbow trout and lake whitefish.

Threatened/Endangered Species

Several threatened and endangered wildlife species are found in Glacier National Park. These include the threatened grizzly bear (*Ursus arctos horribilis*), the endangered bald eagle (*Haliaeetus leucocephalus*), the endangered gray wolf (*Canis lupus*), and the endangered peregrine falcon (*Falco peregrinus*). There are no known threatened or endangered plant species in the park.

The grizzly bear passes through areas adjacent to the roadway on the west side of the pass, although the animal is highly mobile by nature and does not stay long. No key habitat such as important food production areas or denning areas would be affected.

The bald eagle is in the area near Lake McDonald, both as an autumn migrant in large numbers and in much smaller numbers as a nesting species, although these numbers have declined. In recent years, as many as 639 migrating bald eagles have congregated on McDonald Creek when the kokanee salmon make their fall spawning run from late October to early December.

Grizzly bears occasionally use the pass meadows for a few days, then wander on. The trail from the visitor center to Hidden Lake overlook is periodically closed to public use due to grizzlies frequenting the area.

Grizzly bears occasionally traverse the Rising Sun area, but there is no evidence of habituation to developed areas. Although bald eagles have been observed feeding at the St. Mary Lake outlet, there are no known nests in the area. There are no peregrine falcon eyries in the Rising Sun area. Although a gray wolf was sighted near Two Dog Flats six years ago, there is no known activity in this area of the park.

Threatened and endangered species that may use the general St. Mary area are the grizzly bear, bald eagle, and possibly the peregrine falcon and gray wolf. Use of the area is temporary and amounts to passing through. Grizzly bears are periodically sighted 1 mile away on Red Eagle Trail, and a fatal mauling by a grizzly occurred ½ mile away on Divide Creek in 1980. In the winter, several bald eagles are seen fishing in the open water at the outlet of St. Mary Lake adjacent to the roadway. These eagles presumably roost in the vicinity during the winter season, when few visitors are present. There are no bald eagle or peregrine falcon nests in the area. Peregrine falcons may fly through and have been sighted nearby outside the park. Wolves frequent the St. Mary area, but these are likely only transient individuals. There are no known breeding populations nearby. A gray wolf was sighted in the St. Mary area in 1984, and other gray wolves have been sighted several miles from the area. On the nearby Blackfeet Reservation, several cows were killed by wolves in the mid-eighties. All but one of the wolves was either shot or trapped and removed.

Water Resources

Groundwater throughout Glacier National Park is considered to be of very high quality. Several wells are in use throughout the park and water quality is tested regularly. Groundwater supplies would not be affected under any of the proposed alternatives.

Surface waters along Going-to-the-Sun Road consist of lakes, ponds, rivers, and perennial and intermittent streams.

Going-to-the-Sun Road skirts the shoreline of the two largest lakes in the park, Lake McDonald and St. Mary Lake. The road also crosses St. Mary River and numerous named and unnamed streams. Named creeks west of the divide include Avalanche, North Cannon, Logan, Alder, and Haystack and east of the divide Sunrift, Siyeh, Rose, Baring, Two Dog, Lunch, and Divide. Packers Roost Road also crosses Alder Creek.

Creeks on the west side of the divide form the headwaters of Lake McDonald. This 10-mile-long lake was formed when the last glacier retreated, leaving behind a natural dam composed of stratified gravel.

The St. Mary River gathers its water from the east side of the Continental Divide and flows into upper St. Mary Lake. The lake is formed by an alluvial fan at the mouth of Divide Creek and has a surface area of 3,928 acres. The total watershed encompasses about 130 square miles. Peak flows take place in June during spring runoff, which carries considerable quantities of rock, gravel, and mud. Cold water and frequent winds restrict swimming and boating on St. Mary Lake.

Floodplains/Wetlands

Going-to-the-Sun Road crosses numerous creeks and streams (see the "Road and Traffic Analysis, Roadway Characteristics" section). Entrance, access, and internal roads to or within existing units of the system are excepted actions under NPS procedures for implementing EO 11988, "Floodplain Management" (45 FR 35916 as revised by 47 FR 36718).

There is little wetland vegetation that would be affected by road construction. Most vegetation along existing streams is not dependent on the stream for survival, the definition of a wetland. However, staging and storage areas would need to be carefully selected to avoid wetlands.

Air Quality

Glacier National Park is designated as a class I area under the provisions of the Clean Air Act amendments (42 USC s 7401 et seq.), which allows little deterioration of air quality. Air pollution is a serious threat to the park and could potentially affect plants and animals, as well as visibility. Particulate and gaseous pollutants have been found in the park biota. There are few sources of air pollution within the park.

Results of fluoride research and monitoring indicate that prior to 1980 high levels of ambient fluoride from the Columbia Falls aluminum plant occurred in the park and accumulated above normal levels in soil, plants, and animals. However, a significant drop in ambient levels occurred in 1980 and 1981 because of improved technology and reduced aluminum production. Another major concern for the park is sulfur dioxide pollution from extensive oil, gas, and coal exploration in Montana, North Dakota, and Canada. Sulfur dioxide from Canadian oil and gas fields has been detected within the park by monitoring and by odor several times.

Another potential source of air pollution at the park is particulates. Sources of particulates include emissions from automobiles, forest and agricultural burning, wood stoves, the forest products industry, dust raised by traffic on unpaved roads and by windblown soil. Monitoring studies for total suspended particulates indicate ion levels of nitrate and only infrequent violations of the standards. However, the data occasionally show high sulfate levels, indicating pollution by distant sources of sulfur emissions.

Visibility at the park has been periodically affected by high winds and smoke from forest fires. Monitoring at the park has shown that the park is receiving acid deposition, but the sources have not been identified.

Some differences in air quality on the east and west sides of the park occur seasonally. Haze from Canadian forest fires can occasionally be seen on the east side of the park in the summer, and in winter some pollutant incursions from the Canadian oil fields occur.

Visual Quality

Travel on Going-to-the-Sun Road gives a unique park experience, profoundly influenced by views of the lakes, mountains, and dense forests enclosing the narrow roadway and then opening into wide vistas. The spectacular vistas from the pass section of the road are an important part of the visitor experience. The slow traffic, frequent curves, and numerous pullouts create an atmosphere that makes this road special to the park and region. The first and second largest state/province populations visiting the park are Montana and Alberta respectively, which suggest a high proportion of repeat visitors to the area.

The experience gained by traveling the road is still an important part of the visitor experience. In their description of the road, Houk, et al. (1984) said:

> The road revealed a portion of the most romantic western landscape the nation has to offer. Not only the wealthy leisure class, but the burgeoning middle class as well could follow the route through stately expanses of virgin forest, past deep, clear, glacier-carved lakes, alongside vertigo-inspiring cliffs, and through luxuriant meadows of delicate alpine flowers.

ROAD AND TRAFFIC ANALYSIS

ROADWAY CHARACTERISTICS

Going-to-the-Sun Road

Going-to-the-Sun Road is an important cultural resource that is significant for its engineering qualities and historic character. The historic qualities of alignment and structure combined with the natural qualities of vegetation, rock, and scenery in the landscape surrounding the road are a key part of the park experience for visitors using the road. Visitors place a high value on the "historic scene" associated with the road, the leisurely pace of visitor travel, and the thrill of driving in a unique mountain environment. The National Park Service manages Going-to-the-Sun Road to preserve its cultural and natural values as well as to maintain this unique visitor experience.

Interpretation of this road corridor is critical because it has examples of all the interpretive themes as defined in the 1980 *Interpretive Prospectus*. These themes include the geological aspects of the park (glacial, historical and geomorphological), the diverse ecosystems, and the past and present relationship that humans have with the park.

Within the overall context of Going-to-the-Sun Road, each section is different in appearance, significance, and character of use. There is a continuous change in the scenery, adjacent resources, and the manner in which visitors see and use the road from the heavily-wooded, enclosed landscape along Lake McDonald to the open alpine zone surrounding Logan Pass and the relatively dry forests and meadows of the east slope. Historic structures such as retaining walls, bridges, and stone parapets predominate in the steep, rocky areas near the pass where construction was more difficult, while in the lower sections vegetation and distant mountain views are more prominent. The park's major developed areas are at the lower extremities of the road where visitor use is concentrated. In contrast, use of the higher areas between Avalanche and Rising Sun is predominantly day-use and of short duration.

The portion of Going-to-the-Sun Road covered by this plan begins at the head of Lake McDonald (milepost 12.10) and ends at the eastern park boundary (milepost 49.79). For analysis purposes, the road has been divided into the same sections as it was in the *Road Rehabilitation Planning Study* prepared for Glacier National Park by the Federal Highways Administration in 1984. The Project Sections map shows the location of each of these road sections. The entire Going-to-the-Sun Road is classified as NPS standard class I, principal public use road.

Although this plan does not includes recommendations for sections 1 and 2 of Going-to-the-Sun Road, a review of past and present actions concerning these sections is important.

Section 1. This section of the roadway starts at milepost 0.00 at the West Glacier park boundary and goes to milepost 2.27, which is 0.55 miles east of the junction of Going-to-the-Sun and Camas roads (T-intersection). The roadway has recently been improved with 14-foot lanes and 2-foot paved shoulders for a roadway top width of 32 feet. The surface of the roadway and roadside conditions are good. Section 1 serves as the major west entrance to the park and handles more traffic than any of the other road sections. The original road has been relocated several times since the late 1800s when it first served as an access from the Belton rail station (West Glacier) to the foot of Lake McDonald (Apgar). The road traverses the flat valley floor between the Apgar Mountains and Belton Hills through an even-aged stand of lodgepole pine resulting from the 1929 fire in the area. With the exception of the historic west entrance station, little of the original historic fabric remains.

Section 2. This section starts at milepost 2.27 and ends at milepost 12.10 (Lake McDonald Ranger Station Road). The present traveling width is 22 feet with gravel shoulders of 1 to 1.5 feet in width, for a top width of 25 feet. The existing roadway and shoulders are in poor condition. This section of roadway is programmed to be reconstructed in 1990 to maintain a paved traveling surface of 23 feet with no shoulders. Drainage and roadbed improvements would be made in this rehabilitation project while retaining much of the historic character of the road.

Section 2 is characterized as a road through a forested environment with occasional views of the lake and distant mountain scenery. Natural values of vegetation, water, and scenic vistas along with historic road alignment predominate in this area with historic structures such as bridge, guardrail, walls, and culverts being less apparent. Visitors using this section of the road are generally beginning or ending a trip across the entire Going-to-the-Sun Road. The approximately 30 turnouts in this section are used for interpretation, scenic viewing, and to allow slow traffic space to pull off the road. One of the park's major developed areas, Lake McDonald Lodge, and the Sprague Creek campground are served by this section.

Section 3. This section of Going-to-the-Sun Road runs from the Lake McDonald Ranger Station Road (milepost 12.10) to a point 0.44 mile north of the Logan Creek Bridge (milepost 21.07). Two portions of road within this section were destroyed by a flood in 1964 and were reconstructed to an improved roadway standard. The older portions of the road have 11-foot lanes with untreated shoulders that vary from 0 to 2 feet in width. The roadway top width varies from 22 to 26 feet. The pavement, shoulder, and drainage conditions are fair, as is the foundation/stability condition. The 1965 reconstruction sections are in good condition, with 11-foot lanes, 3-foot paved shoulders, and a 28-foot roadway top width. There are bridges at Avalanche and Logan creeks in this section of road, and a concrete box culvert is at North Cannon Creek (milepost 19.59). The Avalanche and Logan Creek bridges are historic, and further description can be found in the "Cultural Environment, Historic Resources" section. The deck width at North Cannon Creek is 22 feet between stone parapets, and the length is 12 feet. The general condition is good, but the deck is narrow.

This section of road is characterized by its close relationship to the creek and the use of an abundance of stone parapet and retaining wall structures on the creek side. These historic structures serve as a safety barrier between the road and creek, but also act to support the roadbed and define the numerous interpretive turnouts overlooking the creek. Several historic stone bridges and a stone-faced horse-trail underpass are in this section. Views are primarily of the creek and vegetated roadside with occasional vistas of the mountains. The Garden Wall segment of Going-to-the-Sun Road is visible from several points along this section. The Avalanche campground, picnic area, and interpretive trail are adjacent to the road at Avalanche Creek and the historic Logan Creek patrol cabin is visible from the Logan Creek Bridge.

Section 4. Section 4 begins at a point 0.44 mile north of the Logan Creek Bridge (milepost 21.07) and continues to the west portal of West Side Tunnel (milepost 23.35). The existing roadway top width is 22 feet and there are no shoulders. The pavement and drainage conditions are poor, and foundation/stability conditions are fair. The failing roadway embankments on the south approach to West Side Tunnel need to be stabilized. Existing roadside ditches are extremely narrow and restricted in drainage capacity. There is a double box culvert at Alder Creek (milepost 22.32) with 10- by 8-foot and 6- by 4-foot barrels. The deck width between the stone-faced parapets is 22 feet. The structure is in good condition, but the capacity is limited and the structure cannot feasibly be extended.

This section is constructed on a steep side slope that was burned in 1967 and begins the 6 percent grade that continues to Logan Pass. Because of the fire, the former forest along the roadside has been replaced by shrub and low tree growth that allows open views of the upper McDonald Creek valley and adjacent Livingston Range. This section contains several sections of historic stone guardrail and the west portal of the West Side Tunnel.

Section 5. This section begins at the west portal of West Side Tunnel (milepost 23.35) and extends to Logan Pass Summit (milepost 31.76). The original construction in 1932 developed a 16-foot, one-lane road with a roadside ditch on the inboard side of the road. The road was modified for two-lane use by converting the ditch to traffic use. The pavement width varies from 18 to 21 feet and is in fair to good condition, and the roadway top width varies from 19 to 24 feet. There are no shoulders, and the drainage condition is poor. The foundation/stability condition is fair. Because of the roadway expansion into the ditch, traffic gets close to irregular, protruding rock faces in many of the roadway cut areas. Stone parapets on the outboard side of the road are subject to damage and displacement by heavy snow loads.

Three structures are in this section of road, two of which (West Side Tunnel and Triple Arch Bridge) are historic and described in the "Cultural Environment, Historic Resources" section. A box culvert crosses Haystack Creek (milepost 27.06), and the roadway is 23 feet wide between stone parapets. The length is 10 feet, and the general condition is good.

This section, which traverses the most spectacular section of Going-to-the-Sun Road, is the area responsible for the famous "white-knuckle" driving experience attributed to the road because of such features as the narrow driving lanes, protruding rocks, and close proximity to vertical rock faces several hundred feet high. Interpretive and scenic turnouts include the Loop, Birdwoman Falls overlook, Weeping Wall, and Oberlin Falls areas. Historic rock retaining walls, stone parapets, and drainage structures are prevalent in this section along with historic features such as the Road Camp (now used as a maintenance area) and Triple Arches. Some of the original stone parapet has been destroyed by avalanche activity. In these areas, wooden guardrail that is removed each winter has been installed. These structures coupled with the spectacular roadside setting and views of the surrounding mountains combine to make up the unique character of Going-to-the-Sun Road.

The stone parapets, many of which date back to the original highway construction, are deteriorating. Deep snows (ranging up to 120 feet in winter) develop high lateral, vertical, and overturning pressures on the parapet structures. Some parapets are also subject to destruction by avalanche as well as by an occasional vehicular accident. Some stone parapets are identified as being in poor condition, either tilted because of lateral snow pressure or disintegrating. Other stone parapets are significantly lower than the average parapet height. The major cause of the lowering of the rail height is from settlement caused by poor footings and soil conditions. Successive road resurfacings, which have increased the elevation of the roadway surface relative to the height of stone parapets, is also a contributing factor. The original road surface was gravel and, when the road was paved, a new gravel layer and pavement top was added, raising the road surface. Because this is combined with the successive road resurfacings, it has resulted in lower-than-standard stone parapets.

Section 6. Logan Pass Summit (milepost 31.76) is the beginning of section 6, which ends at St. Mary Falls trailhead (milepost 38.65). The pavement and roadway top widths on this section of road vary between 22 and 23 feet, and there are no shoulders. The pavement and foundation/stability conditions are good; the drainage condition is fair to good. Four areas of shoulder and embankment failure need correction, perhaps by construction of retaining walls. Several of the rubble masonry paved waterways need to be repaired or replaced. The East Side Tunnel (milepost 32.87 to 32.95) and the Sunrift Gorge Bridge (milepost 39.35) are in this section and their descriptions can be found in the "Cultural Environment, Historic Resources" section.

This section traverses a steep, rocky side slope overlooking the upper St. Mary River valley. It contains several areas of historic stone parapets and the stone-faced East Side Tunnel.

Section 7. This section of road begins at St. Mary Falls trailhead (milepost 38.65) and ends at Rising Sun (milepost 43.65). The pavement width varies from 21 to 22 feet, and the gravel shoulder varies from 1 to 4 feet with a roadway top width of 23 to 28 feet. The pavement and shoulder condition is poor, the foundation/stability is fair, and the drainage condition is good. New guardrails need to be placed, and some existing stone parapets need to be repaired.

Section 7 is primarily in a forested setting with occasional views of the distant mountains, glaciers, waterfalls, and lakes. Natural vegetation and scenic values predominate except at the Sunrift Gorge and Sun Point areas where historic rock retaining walls, stone parapets, and a bridge are prominent features. Visitor use of this section is primarily sightseeing. Trailhead parking is provided at Sun Point, Sunrift Gorge, and Gunsight Pass overlook.

Section 8. Section 8 begins at Rising Sun (milepost 43.65) and ends at the junction of US 89 at St. Mary (milepost 49.79). The pavement width averages 21 to 22 feet with 1- to 3-foot gravel shoulders and a roadway top width of 23 to 26 feet. The pavement and shoulders are in poor condition. The drainage and foundation/stability condition is fair to poor. Bridges in this section include Rose Creek (milepost 43.65), St. Mary River (milepost 49.01), and Divide Creek (milepost 49.68) bridges. The St. Mary and Divide Creek bridges are described in the "Cultural Environment, Historic Resources" section. The Rose Creek Bridge is a three-span concrete flat slab, 27 feet wide with 4- foot curbs on each side. The bridge is 41 feet long, and the rails consist of architectural metal. The west abutment is unstable and has partially failed.

The road in section 8 traverses an open, relatively dry landscape along the shore of St. Mary Lake, with scenic views of the surrounding mountains. The natural values of vegetation and scenery predominate in this section. Historic structures are limited to the St. Mary and Divide Creek bridges.

Packers Roost Road

The existing Packers Roost Road is a 10-foot-wide graded dirt road that is in poor condition. The road is 0.6 mile long; there are no shoulders and the average operating speed is 15 miles per hour. The drainage condition is poor and the foundation/stability condition is fair. The road crosses the Alder Creek Bridge, a log-stringer bridge that is 14 feet wide and 24 feet long and is in critically poor condition.

Camas Road

Camas Road is 11.66 miles long and runs from the T-intersection with Going-to-the-Sun Road to the junction with County Road 486 (North Fork Flathead River Road). The roadway top width is 27 feet, with 2-foot paved shoulders. There are two bridges along the road: the reinforced concrete T-beam McDonald Creek Bridge and the prestressed reinforced concrete girder North Fork Flathead River Bridge, both of which are 26 feet wide. Both bridges are in good condition.

Sun Point Road

The two-lane Sun Point Road is 20 feet wide, with 3-foot untreated shoulders, and 0.26 mile long. The drainage and foundation/stability condition are fair and the average operating speed of the roadway is 35 miles per hour. The intersection with Going-to-the-Sun Road is a double Wye, which is causing congestion and creating traffic operation and safety problems.

North Fork Road

North Fork Road runs between Camas Road and the Kintla Lake campground. This class II road, which crosses rolling terrain, is intended to be an access route to the park's west side facilities and features. The road is approximately 40 miles in length and varies in width from 11 to 36 feet. The road is entirely gravel except for a 1.13 mile segment between Camas Road and the Fish Creek campground (which is paved). The average speed on North Fork Road is between 20 and 30 miles per hour.

Two Medicine Road

Two Medicine Road connects Going-to-the-Sun Road with Two Medicine Lake. This paved class I road is just over 7 miles long and is 26 feet wide, with 2-foot paved and turf shoulders. The average speed on this roadway is 35 miles per hour.

Chief Mountain Highway

Chief Mountain Highway extends approximately 14 miles from the junction of US 89 to the international boundary; only 3½ miles of the route are within the park boundary. This class I 28-foot-wide paved highway, with 3-foot paved and turf shoulders, passes through rolling terrain and has an average vehicle speed of 45 miles per hour.

Many Glacier Road

The Many Glacier Road runs from the US 89 junction at Babb to the park entrance gate (section 1; slightly less than 5 miles) and from the park entrance gate to the Swiftcurrent Lodge parking area (section 2; approximately 7½ miles). This paved and gravel class I road is 24 feet wide with 2-foot shoulders. It traverses rolling to moderately rugged terrain and has an average operating speed of 45 miles per hour.

US Highway 89 (Blackfeet Highway)

US 89 parallels the eastern boundary of Glacier National Park and provides access to the park at St. Mary (Going-to-the-Sun Road) and at Babb (Many Glacier Road). This paved road offers spectacular views of Glacier and is a popular route for recreationists traveling in the Rocky Mountain region. The road also serves as a direct route to Canada, and connects to Canadian Highway 2 at the Port Piegan port-of-entry.

Parking Areas and Turnouts

There are over 130 turnouts in the section of Going-to-the-Sun Road covered by this plan. Some are turnouts with formalized parking, and others are merely extensions of the existing road shoulder that have been paved to serve as slow vehicle pullovers. An itemized list of these turnouts can be found in table 4.

Table 4: Going-to-the-Sun Road Turnouts*

Milepost	Description	Dimensions**	Milepost***	Description	Dimensions
12.10L***	L McDonald Ranger Station Road	15x675	16.84L	Small turnout	26x147
12.11	Road closure gates		17.07L	Turnout	15x348
12.32L	McDonald Falls turnout	15x675	17.27L	Red Rocks Point turnout	54x294
12.77L	Sacred Dancing Cascade	14 sm sp	17.63L	Turnout	20x213
13.00R	Turnout, gravel (Mt. Brown)	14x156	17.76L	Turnout	28x228
13.43R	Moose Country turnout	25x480	17.90L	Turnout	19x351
13.77R	Gravel road		18.33R	Avalanche View turnout	15x357
13.90R	Small turnout, view of falls	24x210	18.69L	Turnout	17x270
14.19L	McDonald Creek overlook	55x375	18.88L	Turnout on curve	24x258
14.35L	Small turnout	22x225	19.24L	Turnout	17x285
15.28L	Camp 8 pit turnout	25x531	19.56	North Cannon Creek	
16.08L	Avalanche Creek turnout	19 spaces	19.70R	Turnout	2-car
16.13R	Road to trailhead parking		19.87L	Gravel service road	
16.15R	Small turnout, before bridge		20.22R	Turnouts, comfort station	24x246
16.19l,R	Turnouts, after bridge	small -	20.43L	Gravel turnout	12x201
16.22R	Small turnout, gravel	27,210	20.62	Logan Creek Bridge	
16.43L	Sperry Glacier View turnout	23x165	21.73L	Gravel turnout on curve	23x228
22.11L	Tiny turnout		23.99R	Upper loop	29 sm sp
22.16L	Packers Roost Road		24.04L	Turnout	17.162
22.20L	Gravel turnout	25x147	24.11R	Turnout	17x231
22.27L	Turnout	17.96	24.44R	Turnout	8x60
22.29R	Turnout, gravel/paved	2-car	24.58R	Crystal Point turnout	26x102
22.33L	Granite Creek turnout	22x225	24.78R	Series of 3 turnouts	1-car
22.75L	Turnout	15x87	25.08R	Turnout	10x165
22.88L	Turnout	15x108	25.16R	Turnout, gravel/paved	8x90
23.02L	Turnout, gravel/paved	12x84	25.50R	Swede Point turnout	18x102
23.05L	Fossil algae deposit	very small	25.70L	Granite Creek turnout	20x90
23.13L	Turnout, gravel/paved	8x180	25.85L	Little Granite Creek turnout	
23.26L,R	Widened shoulders		25.99R	Alden Trail turnout, grav/pav	18x126
23.34	West portal, West Side Tunnel		26.30R	Turnout	14x108
23.39	East portal, West Side Tunnel		26x37R	Turnout, fire exhibit	25x324
23.42L	Turnout	12x75	26.57R	Turnout	15x306
23.60R	Rockfall area	15x153	26.67L	Road Camp turnout	30x105

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*Paved unless otherwise marked

**Feet

***L= left; R=right; L,R=both sides

Milepost	Description	Dimensions**	Milepost	Description	Dimensions
23.82R	Turnout	14x174	26.67R	Turnout w/radiator water	30x165
23.92R	Lower loop	2 lots	26.79R	Birdwoman Falls turnout	30x18
26.93R	Turnout – right	15x135	31.09L	Turnout, rockfall area	8x50
27.02L	Haystack Creek culvert		31.12L	Turnout, gravel	
27.51R	Glaciation interp turnout	24x444	31.17L,R	Turnout, grav/pav	small
27.69L	Grouse Point turnout	10x345	31.25L,R	Oberlin Falls/Garden Wall/ Lewis Range turnouts	15x270
28.63L	Weeping Wall begin				
28.79L	Weeping wall end		31.32L,R	Shoulder widening, gravel	20x300
28.94R	Alpine Sanctuary turnout	30x450	31.38R	Shoulder widening	
29.60L	Riprap Point turnout		31.42R	Shoulder widening, gravel	
29.78	Triple Arch Bridge		31.47L	Turnout, gravel	
29.80L	Shoulder widening	8x60	31.66R	Shoulder widening	20x680
29.82L	Shoulder widening		31.68L	Shoulder widening	20x420
29.84R	Shoulder widening		31.72R	West entrance Logan Pass	162 sm, 281
30.20L	Shoulder widening		31.77R	Shoulder widening	12x250
30.40L	Shoulder widening		31.82R	East entrance Logan Pass	
30.60L	Shoulder widening	15x105	31.10R	Big Drift turnout	12x60
30.84R	Shoulder widening, grav/pav	15x114	32.30R	Widened shoulder	20x265
31.04R	Turnout	8x18	32.40R	Turnout w/wall	16x156
32.44R	Turnout	14x160	34.78R	Turnout, gravel	12x135
32.48	Lunch Creek		34.97R	Turnout	29x390
32.71R	Turnout w/wall	17x186	35.06R	Turnout	29x390
32.86	West portal east side tunnel		35.49R	Shoulder widening	6x120
32.94	East portal east side tunnel		35.73R	Turnout	21x234
33.03R	Turnout	14x126	36.07R	Shoulder widened	12x50
33.10R	Turnout	14x165	36.35	Road gates	
33.21R	Turnout	24x240	36.39R	Jackson Glacier turnout	28x363
33.35R	Turnout	24x144	36.48R	Gunsight Pass trailhead	27x486
33.56R	Turnout	25x156	37.06R	Shoulder widening, gravel	
33.82R	Turnout	25x240	37.19R	Turnout, avalanche sign	65x477
34.25R	Turnout	18x210	37.75R	Slow vehicle pullover	21x219
34.36R	Turnout, gravel/paved	35x300	37.91R	Turnout	35x213
34.47L	Shoulder widening		38.27R	Turnout	12x100
34.51	Siyeh Creek		38.54R	St. Mary Falls trailhead	21x372
34.56L	Shoulder widening		38.73R	Turnout, horse loading area	17x165
34.56R	Turnout		38.98R	Turnout	18x306
34.59R	Turnout	35x200	39.17L	Turnout	12x50
39.19R	Turnout	15x200	42.78R	Wild Goose Island turnout	24x393

Milepost	Description	Dimensions**
39.23	Sunrift Gorge Bridge	
39.26L	Turnout (extra shoulder)	
39.26R	Turnout	35x300
39.33R	Turnout, gravel	
39.55L	Gravel road	
39.56L	Shoulder widening	15x108
39.82R	Sun Point, west entrance	
39.89R	Sun Point, east entrance	
40.24R	Slow vehicle pullover	20x300
40.55R	Slow vehicle pullover	13x198
40.87R	Shoulder widening	13x138
41.24R	Turnout	30x573
41.28L	Turnout	16x261
41.85R	Turnout	27x186
42.03R	Shoulder widening	21x375
42.60L	Wild Goose Island turnout	27x228
42.74L	Wild Goose Island turnout	20x276
48.96R	Turnout	50x138
49.00	St. Mary River Bridge	
49.18L	West entrance visitor center	
49.26	Entrance booth	
49.30L	East entrance visitor center	
49.48R	Service road	
49.67	Divide Creek Bridge	
49.78	Junction with highway 89	
Milepost	**Description**	**Dimensions**
43.04R	Turnout	39x330
43.43R	Boat launch parking area	
43.56L	Rising Sun campground road	
43.59	Rose Creek Bridge	
43.70R	Rising Sun picnic area road	
44.38R	Turnout	12x123
44.59R	Turnout, gravel	12x54
45.25R	Turnout	14x129
45.42R	Triple Divide Creek turnout	18x162
46.32R	Turnout	21x213
47.26L	Two Dog Flats turnout	16x129
47.89R	Turnout	24x231
48.23R	Turnout, gravel	12x165
48.46R	Widened shoulder, gravel	20x60
48.66	Road closure gates	
48.70R	Turnout	24x288
48.82L	St. Mary campground road	

TRAFFIC CHARACTERISTICS

Traffic Counts

The Montana Department of Highways obtained traffic counts in various locations in the park during the period of July 11-18, 1984, and July 31, August 1-2, and 5-9, 1985. NPS staff obtained additional counts during August 2-13 at selected locations on park roads in 1984. Table 5 shows ADT for 1984, 1984 peak-day traffic (usually Sunday) for the survey periods, and the peak-hour traffic for the survey period (usually on the peak day). Appendix A details the history of traffic counter data and an analysis of traffic volumes.

The National Park Service opened five continuous count stations on park roads in July 1985 to record counts year-round (if roads were open). Table 6 shows the results of these counts for the five stations. There have been considerable fluctuations in volumes at these stations since 1984. The overall increase over the four-year period amounted to 4.6 percent. (See appendix A for additional detail.)

It is difficult to project traffic volumes in the future based on only four years of data. Consequently, overall park visitation becomes an important factor in traffic forecasts for the future. These four-year trends perhaps indicate a leveling-off of traffic volumes during high-use periods in Glacier National Park.

Table 5: Traffic Volumes (1951 and 1984)

Road Segment	1951 ADT[1]	1984 ADT[2]	1984 Peak Day[3]	1984 Peak Hour[3]
West entrance road	2,200	4,790	5,880	590
Apgar Road		2,450	2,670	280
Apgar Road east of Apgar		1,080	1,310	110
North Fork Road between Fish and Fern creeks	90[4]	140	170	20
North Fork Road at Camas Creek		50[5]		10
Camas Road, north of Fish Creek campground road		520	610	70
Bowman Creek Road north of Bowman Road		130	160	30
Kintla Lake Road north of Bowman Road		70[6]		10
Going-to-the-Sun Road 1.5 miles south of Avalanche Creek	1,630[4]	3,180	4,220	490
Going-to-the-Sun Road at work camp west of Logan Pass		3,000	3,650	460
Going-to-the-Sun Road, 2.8 miles east of Logan Pass		2,800	3,680	440
Going-to-the-Sun Road at St. Mary entrance	1,350	3,220	3,870	420
Many Glacier Road	490	1,440	1,500	160
Chief Mountain Highway	410	1,040	1,070	130
Two Medicine Road	440	620	770	80

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[1] Rounded to the nearest 10

[2] Rounded to the nearest 10 for the duration of the traffic count period only

[3] Rounded to the nearest 10, for the duration of the traffic count period only

[4] Approximate location

[5] Average weekday volume – ADT estimated at 70

[6] Average weekday volume – ADT estimated at 100

Table 6: Traffic Volumes, 1984-1988

	1984[1] ADT	1985[2] ADT	% inc/dec 1984-1985	1986[3] ADT	% inc/dec 1985-1986	1987[4] ADT	% inc/dec 1986-1987	1988[5] ADT	% inc/dec 1987-1988	% inc/dec 1984-1988
West Glacier entrance	4,790	4,220	-11.9	4,490	6.4	4,490	0.0	5,020	11.8	4.8
Camas Creek Road west of Fish Creek campground road	520	490	- 5.8	590	20.4	460	-22.2	510	10.9	- 1.9
Going-to-the-Sun Road from Sprague Creek to Lake McDonald Lodge	3,600[6]	3,220	-10.6	3,410	5.9	3,460	1.5	3,860	11.6	7.2
Going-to-the-Sun Road at work camp west of Logan Pass	3,000	2,520	-16.0	2,740	8.7	2,680	- 2.2	3,030	13.1	1.0
St. Mary entrance	3,220	2,970	- 7.8	3,130	5.4	3,090	- 1.3	3,410	10.4	5.9

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[1] ADT derived from survey periods noted in text
[2] ADT derived from counts from July 20 through August 9
[3] ADT derived from counts from July 19 to August 8
[4] ADT derived from counts from July 18 to August 7
[5] ADT derived from counts July 17-August 6
[6] Estimated from 1984 average weekday traffic and ADT at the Sprague Creek and Work Camp locations

US 2 west of Glacier National Park records the highest traffic volumes in or near the park. In 1983, at Martin City, July ADT amounted to 7,271, peak-day traffic was 9,082, and peak-hour traffic amounted to 765. The July ADT at this location amounted to 7,321 in 1984, 7,315 in 1985, and 7,960 in 1986. The 1985 and 1986 volumes may have been affected by construction traffic during the reconstruction of US 2 west of the park during these two years. In 1987 and 1988, the July ADT amounted to 8,333 and 9,500 respectively.

Roadway Capacity

The measure by which a particular roadway is fulfilling its function of carrying traffic is determined by a capacity analysis and by establishing the level of service at which the highway is operating. The capacity of a highway is defined as the maximum number of vehicles per hour that can be handled by a particular roadway under prevailing operating conditions.

To function satisfactorily, a roadway must operate at a lower volume of traffic than when the facility is at capacity. The maximum number of vehicles that can be carried on a roadway at any particular level of service is known as the service volume. Levels of service are designated from A through F (with A being the best and F the worst) to cover the full range of traffic operating conditions. These levels of service are described as follows:

> Level of Service A: A free-flowing condition with low volumes and high speeds, little or no restrictions to traffic, and few delays.
>
> Level of Service B: Stable flow with operating speeds and passing beginning to show some restriction. Reductions in speeds may occur with a low probability of traffic flow being restricted.
>
> Level of Service C: Relatively stable flow with speeds (40 mph or higher) and maneuverability more closely controlled by the higher volumes. Most drivers are restricted in their freedom to select their own speed, change lanes, or pass.
>
> Level of Service D: Approaching unstable flow with tolerable operating speeds although considerably affected by changes in operating conditions. Drivers have little freedom to maneuver and pass other vehicles; comfort and convenience are low.
>
> Level of Service E: Represents operations at even lower speeds than level D, with volumes at or near the capacity of the highway. The highest volume attainable under E defines the capacity of the roadway. Flows are unstable and momentary stops may occur.
>
> Level of Service F: Forced or breakdown flow operation at low speeds where volumes exceed capacity. Speeds are reduced substantially and stops may occur for short or long periods of time because of downroad congestion.

Average travel speed, percent time delay, and the traffic flow rate to the capacity of a roadway are three major factors in establishing the various levels of service. Lane width, lateral clearance (nearness of obstructions to the road traveling surface), the amount of heavy vehicles, grades, and passing sight distance are also critical elements in determining the operating conditions of the roadway.

A capacity analysis was undertaken for Going-to-the-Sun Road based on the hourly volumes obtained in 1984. Peak-hour volumes were slightly lower from 1985-1988 on the roadway. This analysis along with visual observation of traffic conditions provides a measure of the operating characteristics of the roadway.

The capacity figures shown in table 7 were determined using methodology in the 1985 *Highway Capacity Manual* (Transportation Research Board 1985) and adjusted for the physical and operating conditions of Going-to-the-Sun Road.

Table 7: Going-to-the-Sun Road Capacity/Level of Service Analysis

Road Segment	1984 Peak Hour Volume	Level of Service E Range of Volumes	1984 Level of Service
West entrance to Camas Road	590	1,000-2,005	D
Camas Road to Lake McDonald Lodge	490	520-1,320	D
Lake McDonald Lodge to Avalanche Creek campground	490	520-1,320	D
Avalanche Creek campground to Logan Creek	460	540-1,030	D
Logan Creek to west portal, West Side Tunnel	460	285-850	E
West Portal, West Side Tunnel to Logan Pass	460	215-685	E
Logan Pass to St. Mary Falls trailhead	450*	285-855	E
St. Mary Falls trailhead to Rising Sun	450*	305-880	E
Rising Sun to St. Mary entrance	430*	555-1,320	D

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*Increased by 3 percent over counts in table 5 due to the fact that St. Mary, Many Glacier, and Two Medicine entrance stations recorded higher counts on several days other than when the traffic counters were in operation. The highest entrance station count at the West Glacier entrance occurred on the same day that the peak day and peak hour traffic were recorded.

Source: Denver Service Center

The impact of trucks, buses, and recreational vehicles in the traffic stream were also factored into the capacity analysis using the methodology presented in the 1985 manual.

The figures indicate that the section of the roadway from approximately the west portal of the West Side Tunnel to Logan Pass (section 5) was nearer capacity than any other section of the park road system during July 1984. The sections from Logan Creek to Rising Sun (sections 4, 5, 6 and 7) were operating at level of service E. Segments nearest the west and east entrances have greater capacity levels and were operating at level of service D.

As indicated earlier, the highest volume attainable under level of service defines the capacity of a roadway. As an example, if the hourly volumes on the section of roadway from the West Side Tunnel to Logan Pass exceed 685 vehicles per hour, level of service F is expected to occur with forced flow and traffic stop-and-go conditions. At the time capacity is reached, travel time will increase along with congestion. If delays are lengthy, visitor experience will be affected by vehicle backups or queues. Along with potential degradation of visitor experience and public accommodation, peak traffic periods will be longer in duration and vehicle drivers may seek routes outside of the park (e.g., US 2 south of the park).

This information should be used as a guide and not as an absolute standard. The roadway operating conditions on Going-to-the-Sun Road are much different than typical rural two-lane highways, and operating conditions should be less congested during other than the peak hour of the traffic survey periods.

Parking Problems

Parking problems and occupancy were observed during the period of August 2-13, 1984. Table 8 shows the use of selected parking areas along Going-to-the-Sun Road. From the observations of these areas, parking was at or above capacity at Apgar Village, the Loop, Logan Pass, Jackson Glacier/Gunsight Pass trailheads, and Sunrift Gorge.

Table 8: Parking at Selected Sites – August 1984

	Number of Spaces				
	Marked		Unmarked		Vehicles Parked
Area	Lg.	Sm.	Lg.	Sm.	High-Use Period
Apgar Village			8	102	—*
Lake McDonald Lodge	14	114			90
Sacred Dancing Cascade				14	8
Avalanche Creek/Trail of Cedars		38			35**
Loop (2 areas)		29			30**
Oberlin Creek				20	14
Logan Pass	28	162			235***
Lunch Creek				25	15
Siyeh Bend				27	20
Jackson Glacier/Gunsight Pass trailhead				17	25**
St. Mary Falls trailhead				?	16
Sunrift Gorge				8	11**
Sun Point				?	35
Wild Goose Island				25	7
Rising Sun				105	27
St. Mary visitor center	10	41			28
Many Glacier hotel	8	175		6	130
Many Glacier picnic area				50	31
Swiftcurrent Lodge parking lot				101	64
Two Medicine				60	23

Source: Denver Service Center
*Capacity exceeded but no count taken
**At capacity or capacity exceeded
***Capacity reached 10 a.m. to 4:30 p.m.

Each of the areas with a capacity problem or a congestion/circulation problem is discussed below in the order shown in the table.

Apgar Village. The parking capacity of the area is exceeded during high-use days. The small parking lot east of Eddie's Cafe is congested. Ingress and egress become more difficult as the lot nears capacity, particularly if a camping or boat trailer is towed into the lot. Congestion occurs in the circle due to vehicle turning movements conflicting with parking maneuvers and pedestrian use.

Lake McDonald Lodge. At the present time, parking space appears to be adequate, but approaching capacity, in this area. Problems are caused by the configuration of the one way entrance/exit and associated parking that requires a driver unable to find parking to exit the area, make a U-turn across Going-to-the-Sun Road, and then cut back toward the lodge area. These traffic conflicts would be corrected by proposals in the Lake McDonald development concept plan, which is currently being revised.

Avalanche Creek/Trail of Cedars. The parking in these areas is at capacity during high-use periods. There is parking on both sides of the roadway and east and west of the bridge over the creek. There is poor sight distance to the east from the parking area on the north side of the roadway adjacent to the picnic area. The entrance to the Avalanche Creek campground is located on the opposite side of the road. The Avalanche Creek and the Trail of Cedars trailhead is immediately east of this area. Pedestrian movement is across Going-to-the-Sun Road and across the bridge. Parking maneuvers, vehicles entering and leaving the picnic and camping areas, and pedestrian movement on the roadway create a congested situation. Many of these problems will be corrected when the approved Trail of Cedars plan (NPS 1984b) is implemented. Existing roadside parking areas would be replaced with off-road parking.

Loop. The upper and lower parking lots are at capacity during high-use periods. Poor sight distance exists at the sharp curve, particularly when drivers exit the upper loop and try to view the roadway downhill. Pedestrians entering or leaving the Granite Park Chalet Trail cross the roadway at the sharp curve. When the parking areas are near capacity, drivers are looking for empty parking spaces or viewing the roadway and are often surprised by a pedestrian crossing the roadway or attempting to cross the roadway. Long-term trailhead parking also limits short-term parking use of the overlook area.

Logan Pass. On high-use days, the parking area fills by 10:00 a.m. and continues to be full until 4:30 to 5:00 p.m. Vehicles are parked in unmarked spaces within the parking lot and also park on the south shoulder of Going-to-the-Sun Road between the two entrances to the parking lot and on the north shoulder west of the west entrance. When the parking lot is full and the road shoulders are being used for parking, drivers circulating to find parking spaces and attempting to enter the parking lot create additional congestion. There were approximately 45 vehicles parked on the shoulders or in unmarked spaces during the periods of observation. This requires at least one park staff person to direct traffic and parking in the area in late morning or early afternoon. Longer-term trailhead parking occurs simultaneously with day-use visitor parking, lowering the parking turnover rate required to accommodate the day-use visitor. This area generates the greatest vehicular congestion in Glacier National Park.

Jackson Glacier/Gunsight Pass Trailheads. The capacity of the parking area is exceeded during high-use periods.

Sunrift Gorge. The parking contiguous to the roadway does not meet the demand for spaces. Parking is provided on the shoulders in the eastbound lane in two pullout areas. When these two areas are at capacity, drivers park on the shoulder not designed for parking and encroach on the westbound lane. A potentially dangerous pedestrian crossing is at the west edge of the first parking area immediately east of the gorge bridge.

Many Glacier Hotel and Swiftcurrent Lodge. Parking space is ample in the hotel parking lot. Circulation and parking problems in these areas were addressed in the approved development concept plans (NPS 1986).

Traffic Forecasts

A number of factors were considered in preparing traffic forecasts, including park visitation and state and national travel forecasts. Population and travel in the United States are increasing and are expected to continue to increase. The only significant decreases in traffic volumes on the nation's roads and streets since 1935 occurred during World War II and in 1974 and 1979. From March 1980 to March 1987, volumes increased by 25.1 percent.

An environmental impact statement prepared by the state of Montana for a section of US 2 between Hungry Horse and Martin City forecasted a 50 to 70 percent travel increase over this section of roadway for a 20-year period ending in 2003. The state highway department generally uses a 2 to 3 percent traffic volume increase per year for highway design and construction The Federal Highway Administration used a 50 percent growth factor on most of the Glacier National Park roads for the year 2000 in the *Road Rehabilitation Planning Study* for the park.

From 1983 through 1985, traffic volumes on US 2 west of the park leveled off. The high-use period summer volume of traffic decreased on park roads in 1985 from 1984 levels, increased in 1986, and was near 1986 levels in 1987. Although park use increased 15.1 percent from 1986 to 1988, the previous four years had seen relatively stable visitation. These trends suggest a leveling off of increases in park traffic and visitor use. These short-range trends may not continue; however, the large increases recorded in the 1950, 1960, and early 1970 decades may not be experienced over the next 20 years.

Based on data, trends, and forecasts reviewed to date, traffic forecasts for various segments of Going-to-the-Sun Road have been developed (see table 9 and appendix 1 for more detail). The table also indicates the estimated roadway capacity for the years 1992 and 2007 based on present operating conditions.

Based on these forecasts, high-use period ADT is projected to reach 5,850 by year 2007 from the west entrance to Camas Road. Peak-day volumes may be between 7,000 to 7,600 vehicles per day.

Based on these forecasts, by the year 2007 all sections of Going-to-the-Sun Road, except sections 1 and 8 near the west and St. Mary entrances, will be operating at level of service E. The section of the roadway from the West Side Tunnel to Logan Pass may be approaching capacity on peak hours. The figure following table 9 shows the maximum peak-hour forecasts for 2007 versus the capacity of the section from the West Side Tunnel to Logan Pass (section 5) as well as incremental increases of the maximum forecast. It is possible that the traffic volumes could be higher or lower than the forecast over the planning period. When peak-hour traffic volumes increase to approximately 200-245 vehicles

Table 9: Going-to-the-Sun Road Traffic Forecasts

Road Segment	ADT[1]	1992 ADT[2]	2007 ADT[3]	1984 Peak Hour	Level of Service E Range of Volume	1992 Peak Hour[4]	1992 Level of Service	2007 Peak Hour[5]	2007 Level of Service
West Entrance to Camas Road	4,500	4,840	5,850	590	1,000-2,005	620	D	710	D
Camas Road to Lake McDonald Lodge	3,420	3,680	4,450	490	520-1,320	510	D	590	E
Lake McDonald Lodge to Avalanche Creek campground	2,960	3,180	3,850	490	520-1,320	510	D	590	E
Avalanche Creek campground to Logan Creek	2,750	2,960	3,580	460	540-1,030	480	D	560	E
Logan Creek to west portal West Side Tunnel	2,750	2,960	3,580	460	285-850	480	E	560	E
West portal, West Side Tunnel to Logan Pass	2,750	2,960	3,580	460	215-685	480	E	560	E
Logan Pass to St. Mary Falls trailhead	2,680	2,880	3,480	450	285-855	470	E	540	E
St. Mary Falls trailhead to Rising Sun	2,680	2,880	3,480	450	305-880	470	E	540	E
Rising Sun to St. Mary entrance	3,100	3,330	4,030	430	555-1,320	450	D	520	D

Source: Denver Service Center

[1] Derived from 1984, 1985, 1986, and 1987 counts

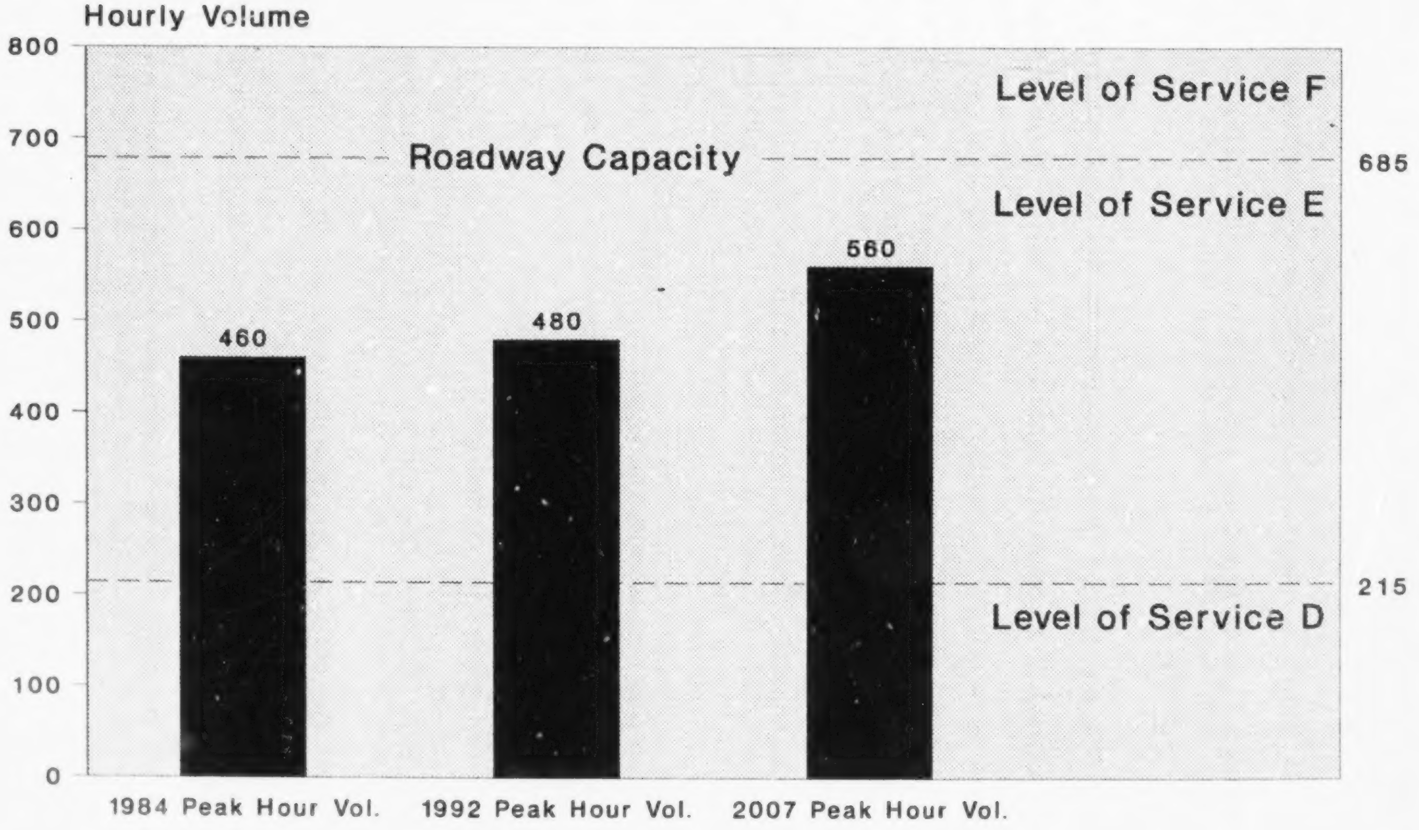
[2] 7.5% increase to 1992

[3] 30% increase to 2007

[4] 5% increase to 1992

[5] 21% increase to 2007

Figure 3: Going-to-the-Sun Road
Capacity/Level of Service - 1984-1987
West Side Tunnel to Logan Pass



per hour higher than recorded in 1984 on the west side of Logan Pass, total traffic breakdown or forced flow may occur.

If these forecasts are reached and vehicular congestion becomes unbearable from traffic delays or degradation of roadside resources, a variety of traffic management or public transit options would be implemented (see "Description of Alternatives" section).

A 30 percent ADT increase and a 21 percent peak-hour traffic increase on roads other than Going-to-the-Sun Road are not expected to cause traffic congestion problems merely from traffic volume increases.

Current Traffic and Bicycle Use Restrictions on Going-to-the-Sun Road

Currently, vehicles or a combination of vehicles and towed vehicles cannot exceed 35 feet in length for the months of September to June between Avalanche and Rising Sun. During the summer tourist season the length is reduced to 30 feet.

The use of bicycles on the roadway is prohibited for safety reasons from 11 a.m. to 4 p.m. from June 15 through Labor Day between Apgar and Sprague Creek and between Logan Creek and Logan Pass. These restrictions for bicycle riders are removed for the shoulder seasons.

The peak-day volume of bicycle traffic arriving at the west entrance amounted to 15 in June and 31 in July 1984, indicating a very low level of bicycle traffic recorded through this entrance. The average figure for July amounted to 8.5 bicycles/day. There may be higher levels of use on sections of Going-to-the-Sun Road if visitors are transporting their bicycles on vehicles and then using the roadway system for recreational biking. There is a bicycle path between park headquarters and Apgar.

ACCIDENT CHARACTERISTICS

Accident Trends

A total of 442 vehicular accidents were reported on park roads in 1983 (90), 1984 (69), 1985 (53), 1986 (72), 1987 (83), and 1988 (75). Table 10 shows park road sections and areas recording three or more accidents per calendar year over the five-year period.

The highest number (44) of reported accidents for the five years occurred on Going-to-the-Sun Road from the Loop to Weeping Wall. This section of roadway is within the most congested portion of Going-to-the-Sun Road when reviewing the capacity of the road. The total number of reported accidents in the park decreased from 1983 through 1985 and increased in 1986 and 1987 to near the 1983 level.

A total of 43.2 percent (191) of all reported park vehicular accidents (442) over the six-year period occurred at locations and road segments on Going-to-the-Sun Road from Logan Creek to Rising Sun. This included the reported accidents at the Loop and Logan Pass parking areas.

Table 10: Location of Two or More Reported Accidents (1983 – 1988)

Location	1983	1984	1985	1986	1987	1988	Total 1983/88
Loop to Weeping Wall (SR)*	9	7	6	7	5	10	44
Weeping Wall to Logan Pass (SR)	7	5	5	4	7	14	42
Logan Pass parking area (SR)	7	2	3	7	8	2	29
Many Glacier Area and access road	5	7	2	4	5	4	27
Logan Creek to Loop (SR)	5	4	2	4	6	6	27
Rising Sun to St. Mary (SR)	8	4	3	6	2	3	26
Foot of Lake McDonald to Avalanche (SR)	3	5	4	5	6	2	25
North Fork Road and campground	3	1	1	3	10	6	24
Jackson Glacier pullout to Rising Sun (SR)	9	1	2	1	3	4	20
West entrance station (SR)	5	4	3	3	3	0	18
Apgar	6	1	4	3	1	3	17
Logan Pass to Jackson Glacier pullout (SR)	4	4	1	2	2	3	16
West Glacier Bridge to foot of Lake McDonald (SR)	2	3	1	1	6	3	16
Loop parking areas and hairpin turns (SR)	7	2	1	0	3	0	13
Avalanche to Logan Creek (SR)	2	3	1	0	3	2	11
Camas Road	0	3	1	2	1	0	7
St. Mary visitor center parking area	3	0	1	0	0	0	4

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*(SR) a section or location on Going-to-the-Sun Road

Source: Park data

Accident Rates by Park Road Segment

Conversion of accident numbers into accident rates based on the numbers of vehicles that enter an intersection or pass through a particular road section is a useful method of analyzing accident data. These rates provide a means of comparing the relative safety of different locations on a road network. The 1984, 1985, and 1986 accidents for July and August for the major park road network were compared to the existing traffic volumes passing over specific road sections in July and August.

Accident rates shown in table 11 were calculated for each road section and expressed in terms of accidents per million vehicle miles traveled (ACC/MVM).

The following information on Montana roads is taken from the *Traffic Engineering Safety Improvements Study, Grand Teton National Park* (Peccia 1985).

Type of Road	Average Accident Rate	Critical Rate
Interstate	1.29	2.83
Primary	2.27	3.78
Secondary	2.76	7.06

Table 11: Accident Rates by Park Road Segment

Road or Section of Road	Miles of Segment	ADT[1]	Number of Accidents	Accident Rate ACC/MVM[2]
Going-to-the-Sun Road				
West Glacier to Camas Road	1.72	4,500	2	1.39
Camas Road to Avalanche Creek	14.46	3,410	4	0.44
Avalanche Creek to Logan Creek	4.45	2,750	3	1.32
Logan Creek to Loop	3.33	2,750	6	3.52
Loop to Weeping Wall	4.70	2,750	15	6.24
Weeping Wall to Logan Pass	3.10	2,750	12	7.57
Logan Pass to Jackson Glacier pullout	4.66	2,680	5	2.15
Jackson Glacier pullout to Rising Sun	7.23	2,680	2	0.55
Rising Sun to St. Mary	6.14	3,110	6	1.69
Chief Mountain Highway	14.22	1,010	1	0.36
Camas Road	11.66	530	3	2.61
Two Medicine Road	6.20	620	2	2.80

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[1] 1984, 1985, and 1986 ADT average

[2] ACC/MVM is accidents per million vehicles miles traveled.

[3] 1984 ADT

The highest accident rate for a single segment amounted to 7.57 on Going-to-the-Sun Road from Weeping Wall to Logan Pass, which is above the average accident rate of 2.27 and 2.76 for state primary and secondary roads in Montana. This rate is also above the critical rates of 3.78 and 7.06 for primary and secondary roads in the state. Accident rates that exceed the critical rate in Montana are considered to be high and indicate the need for investigation and correction. The Montana rates are based on annual data, whereas the park road rates were determined from July and August data. Additionally, the Montana critical rates are based on statewide road standards. Most state primary and secondary roads are less mountainous, wider, and straighter than many of the park roads. Consequently, the rates are not directly comparable between park roads and state highways.

As indicated in the traffic analysis section, the segments from the Loop to Logan Pass are also the most congested when comparing traffic volumes to roadway capacity.

Although the accident rates for the portions of Going-to-the-Sun Road west of Logan Pass are high, the accident severity is low due to slow traveling speeds.

Table 11 also shows that the accident rates for park roads at the lower elevations are about the same as the average accident rate for Montana primary and secondary roads. Where traffic counts and accident data were both available for analysis, Chief Mountain Highway and the Going-to-the-Sun Road segment from Camas Road to Avalanche Creek had the two lowest accident rates of the road segments studied.

VISITOR TRANSPORTATION SYSTEM FORECAST ANALYSIS

Passenger Load Forecast Factors

To calculate the potential passenger loadings for a visitor transportation system, one of the most important factors is the average daily load by month during service.

As shown previously in table 2, the high-use visitation months are June, July, August, and September. Figure 4 additionally illustrates the amount of visits in these four months as a percent of total annual visitation for 1981 through 1987. The range was from 75.9 percent in 1983 to 88.7 percent in 1982; the seven-year average amounted to 87.3 percent.

There is also considerable variance among the four high-use months expressed in average daily use. Table 12 shows average daily use and the percent of use for each day as a percent of July daily use (highest use month).

Average daily use for the months of July 1981 through 1988 amounted to 16,737. Average daily use in June, August, and September amounted to 52, 92, and 36 percent of July daily use, respectively.

Table 12: Visitation of High-Use Months as a Percent of July

Month	1981 ADU	% of July	1982 ADU	% of July	1983 ADU	% of July	1984 ADU	% of July	1985 ADU
June	8,681	47	7,920	46	7,360	46	8,790	51	9,055
July	18,430	100	17,094	100	15,953	100	16,651	100	15,737
August	16,463	89	16,567	97	15,592	99	14,598	88	13,652
September	6,735	37	6,565	38	6,400	36	5,927	36	4,745

Month	1986 ADU	% of July	1987 ADU	% of July	1988 ADU	% of July	1981-88 ADU	% of July
June	9,020	60	9,412	58	9,674	51	8,739	52
July	15,026	100	16,149	100	18,836	100	16,737	100
August	14,836	99	14,068	87	16,405	87	15,272	91
September	4,961	33	6,679	41	6,806	36	6,102	36

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*ADU = Average Daily Use

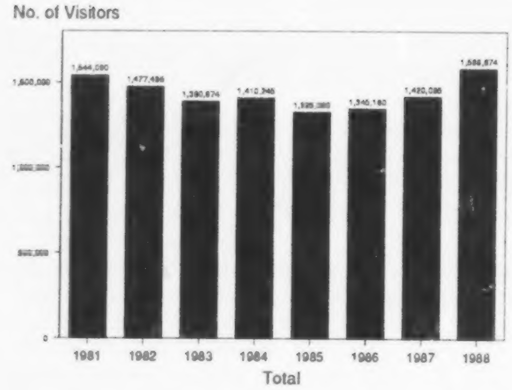
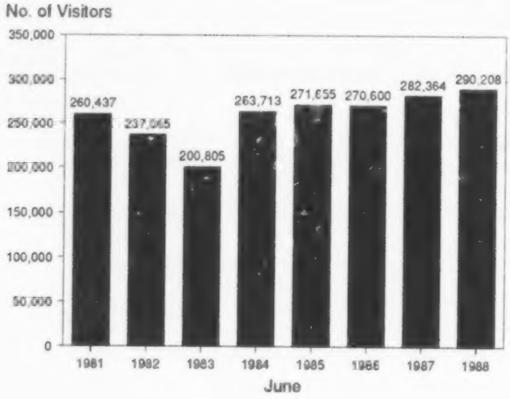


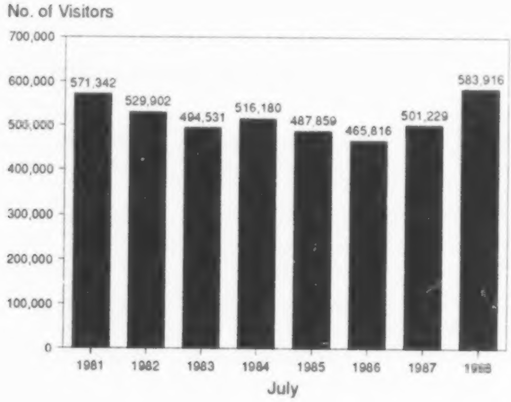
Figure 4: Percent of Visitation
High-Use Period

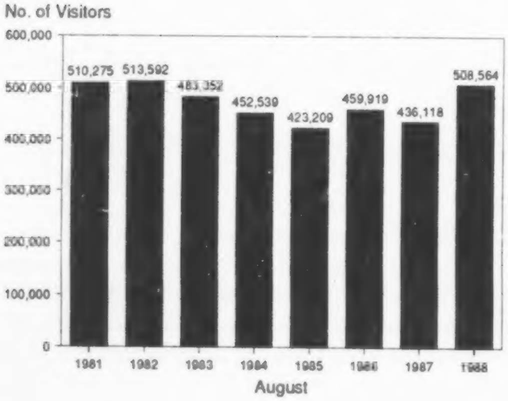
% of Total Year

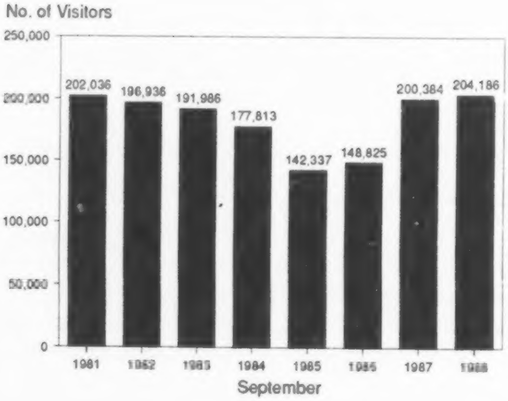
1981	86.4
1982	88.7
1983	75.9
1984	88.2
1985	86.9
1986	85.2
1987	85.5
1988	87.3

8-Year Average 87.3%









Park visitation, traffic data, and the factors described in appendix A were used to prepare a maximum passenger design load forecast for the various park road corridors implementing a voluntary ridership system with existing vehicle length restrictions on Going-to-the-Sun Road.

As an introduction to the forecasts in tables 13 and 14, the current maximum daily design load forecasts for July are as follows:

Road Corridor	**Number of Round-trip Visitors**
Going-to-the-Sun Road From West Glacier to St. Mary and return	400
St. Mary to Many Glacier and return	300
East Glacier to Many Glacier and return	100
Many Glacier to Waterton and return	20
TOTAL	**820**

These maximum projected daily loads for July amount to 5.0 percent of the total visitation in the park based on July visitation from 1981 through 1987 (820 ÷ 16,737). If 10 percent of these persons would ride a bus, the ridership would amount to 1,640 persons per day.

A total of 820 round-trip riders (or 1,640 one-way) was used as a base figure for maximum design passenger loadings per day in July. For July and August 1984, concessioner buses transported an average of 275 persons per day on one-way trips (equivalent to 137.5 per round-trip) amounting to 16.8 percent of the maximum design load forecasts.

Table 13 shows average daily load forecasts for the Going-to-the-Sun Road corridor.

It is presumed that the maximum visitation levels would not be attained in the early years of a voluntary ridership visitor transportation system. Perhaps 50 percent of the maximum loads could be attained in the early startup years of operation under present vehicular use restrictions in the summer.

The column identified as 50 percent of maximum design loads with vehicle size restrictions is an attempt to project passenger loads if more stringent oversize-vehicle restrictions were implemented for travel on Going-to-the-Sun Road. Information from the trailhead survey indicated that 10 percent of the trailhead users surveyed during August used vehicles or vehicles and trailers over 20 feet in length. If this is a valid overall park visitor statistic, then one-half, or 50 percent, might be a reasonable estimate of visitors who would choose to ride a park public transit system. At 50 percent of the maximum design load with large vehicle travel restrictions on Going-to-the-Sun Road, July average day loadings would amount to 620 passengers, with corresponding figures for other months.

Table 13: Round-trip Average Daily Load Forecasts
Going-to-the-Sun Road

Month	Use as % of July*	Max. Load	70% of Max. Load	50% of Max. Load	30% of Max. Load	50% of Max. Load with Vehicle Size Restrictions
June	52	210	145	105	60	320
July	100	400	280	200	120	620**
August	91	370	260	185	110	575
September	36	145	100	70	45	220

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* Based on 1981-1988 data

**2900 ADT average on Going-to-the-Sun Road between Lake McDonald and Rising Sun
(2900 x 5 percent = 145 vehicles) 145 x 2.9 persons per vehicle = 420 persons
(420 + 200 = 620 for July)

Table 14 shows the round-trip average daily load forecasts from Many Glacier to St. Mary.

Table 14: Round-trip Average Daily Load Forecasts
Many Glacier to St. Mary

Month	Use as % of July*	Max. Load	70% of Max. Load	50% of Max. Load	30% of Max. Load
June	52	155	110	80	45
July	100	300	210	150	80
August	91	280	195	140	85
September	36	110	75	55	30

---

* Based on 1981-1988 data

The maximum average daily design load for July was estimated at 300 per day as compared to 400 per day on Going-to-the-Sun Road based on the forecast.

The projected passenger loadings do not reflect high-day usage. The average daily loadings were multiplied by a factor of 1.3 to arrive at the number of additional buses, trips, and time required on high-use days of the operating season.

Operating Season

Other than the four months of June, July, August, and September, it appears that passenger loadings would be very minimal based on park visitation patterns. Loadings would be low until concessioner lodging was open for the season and until campground activity increased in June. These activities would then reduce greatly in September. For analysis purposes, it was estimated that visitor transportation services would be available from June 21 through September 4 or around Labor Day. This would amount to 10 days in June, 31 each in July and August, and four in September for a total of 76 days. Under actual operating conditions, this figure would vary somewhat. It was also estimated that there would be three high-use days in June, 10 in July, 9 in August, and 1 in September. High-use days were estimated to occur on holidays and weekends.

Vehicle Types

The park concessioner, Glacier Park, Inc., owns and operates three types of vehicles at the present time. The most numerous and prominently used vehicle is the White coach (red bus) manufactured in the 1930s. Thirty-three of these vehicles are available for service, with a load capacity of 14 passengers. GPI also has three Flxible buses manufactured in the 1950s, with a capacity of 29 passengers, and six Crown coaches built in 1962, with a capacity of 37 to 41 passengers. The red buses are part of the historical character and scene of the park and are the only buses small enough to be permitted over Logan Pass.

In arriving at vehicle types, the following operating characteristics of buses seem desirable:

ease of maintenance and operation
flexible capacity
economical to purchase and operate
ease of boarding/unloading
dependability
pleasing appearance
low air and noise pollution

Electric, battery-powered buses would be environmentally ideal. They consume no fossil fuels directly, are essentially pollution free, and operate very quietly. However, several disadvantages currently outweigh these positive characteristics. These vehicles have not yet been proven in a rigorous bus operation, and capital and maintenance costs are high compared to more standard vehicles.

Vans, converted vans, light transit vehicles, small modified school buses, and light buses are considered appropriate for traversing Logan Pass because of their short wheel base and overall length. Further description of these vehicles can be found in appendix A.

Smaller vehicles would be less costly and quieter in operation than large conventional transit coaches. The larger conventional coach is not appropriate for use over Logan Pass because of roadway constraints. Large buses could be used on the west side to Lake McDonald Lodge and the east side to Rising Sun and Many Glacier.

For forecasting purposes, a 10-passenger modified van, a 15-passenger modified maxi van, and a 25-passenger vehicle were used for potential service on Going-to-the-Sun Road.

Existing Service and Potential Routes

GPI currently provides service to lodging, train depots, Two Medicine Lake, and other park locations by request. On occasion GPI will pick up lodging visitors at the airport. In addition, sightseeing circle tours have been provided since 1983. The routes and schedules of GPI for 1986-1988 can be found in appendix A. The Bus Routes and Stops map shows the location of existing and potential bus stops.

In 1971 an effort was undertaken to provide shuttle service over Going-to-the-Sun Road. In the interim, several subsequent routes and systems have been proposed but not implemented. These past efforts were mainly based on the idea to provide service to day trail users along Going-to-the-Sun Road.

This analysis expands on these attempts and has determined that potential users of a new public transit system include the following:

> Persons who do not want to drive over Logan Pass
>
> Persons with oversize vehicles
>
> Hikers who enter one trailhead and exit another (reduces the demand for parking spaces at trailheads)
>
> Persons who arrived at the park in other than by private vehicles
>
> Employees of the park and concessioners
>
> Persons desiring an interpretive tour of Going-to-the-Sun Road

Persons staying at campgrounds or in lodging may desire to use a bus for a day-use trip in the park. Lodging guests without private vehicles would use a bus to travel between lodging facilities. GPI currently provides these services between facilities.

An ancillary positive benefit in the provision of bus service would be some decrease in vehicular congestion on the critical section of Going-to-the-Sun Road. The amount of relief would depend on the frequency of bus service and the amount of passenger loadings. As potential routes were reviewed, it appeared that the greatest benefits of a transportation system would occur along Going-to-the-Sun Road because of the high levels of traffic congestion on high-use days and the presence of numerous developed areas and trailheads.

Probably the greatest need for shuttle service is between Lake McDonald Lodge and Rising Sun. This is the section of Going-to-the-Sun Road that is the narrowest, has the greatest gradients and curves, has several trailhead parking areas, and provides service to the Logan Pass visitor center, which has high visitor use and congested parking conditions. Appendix A details the routes and stops selected for analysis.

Capital and Operating Costs

Total annualized costs include capital and operating costs of equipment, capital costs for maintenance and dormitory space, personnel costs, and 20 percent added for operation and maintenance costs. This latter item includes costs for overhead, and/or profit, administration, and contingencies. A detailed explanation can be found in appendix A.

Annualized Cost Implications

These data, presumptions, and forecasts were analyzed by option to arrive at comparative potential bus loadings and costs. Tables 15 and 16 show the results of these analyses. The tables show the number of round-trip passengers, miles traveled, operation time, number of buses required for both average and high-use days, total annualized costs, cost per user, and cost per mile for each option. The number of additional buses and trips per day for high-use days were added to the costs, if applicable. In each option, standby buses were included in the costs incurred for emergency repairs. It should be noted that in the higher bus passenger loading options with smaller vehicles, the number of trips would be greater than those scheduled. It is important to note that the forecasts and following text pertain to round-trip passengers.

As noted earlier in the report, the higher passenger loadings may not be attainable under present vehicular use restrictions and a voluntary ridership system. If 50 percent of estimated maximum loadings is attained (13,265 passengers per season), a 15-passenger van would appear to cost less to operate than a 25-passenger vehicle. In addition, one-hour headways for the whole season would result in lower costs than ½-hour headways in July and August, but convenience and flexibility would be decreased with the longer headways and might result in a lower level of ridership.

If 50 percent loading was attained and vehicle size restrictions were implemented prohibiting any vehicle or vehicle and towed vehicle over 20 feet in length to travel over Logan Pass (perhaps resulting in an increase in ridership of 5 percent of all visitors per day on Going-to-the-Sun Road), the 25-passenger bus would result in lower costs per rider than the smaller vehicles. In a situation with larger ridership (41,125 passengers per season), larger buses would be more cost-effective. However, the cost per mile of the vans would be lower than that of the 25-passenger vehicles.

For comparison purposes, the existing red bus was substituted for a new 15-passenger van using the 50 percent of maximum passenger load with one-hour headways in June and September and ½-hour headways in July and August. This presumed that the red bus would cost approximately $1.05 per mile to operate, that capital costs were amortized, and that operator costs were the same as used for the study forecasts. The costs per user and mile were estimated to be nearly the same for a new 15-passenger van. The number of red buses with high maintenance requirements would not be sufficient to meet the public transit schedule and concessioner lodging transportation requirements in the park.

In addition to the mid-range ridership levels, a level of 123,670 was also analyzed. This level of ridership resulted in the lowest cost per user ($14.13) while using a 25-passenger vehicle. However, it should be noted that the cost per user ($14.71) to haul 41,125 passengers per season was not much greater. With the larger loads, total system costs would be higher due to the demand for the number of vehicles and hours of labor for operation. The ridership level of 123,670 passengers would reduce the number of private vehicles on Going-to-the-Sun Road by approximately 20 percent, thus reducing congestion.

It is important to note that the costs per user reflect round- trips; one-way trips would amount to 50 percent of the costs in tables 15 and 16. It is also recognized that only a portion of the passengers might make a complete round-trip between St. Mary and West Glacier. There would be a larger number of one-way trips between the east and west sides and round-trips between West Glacier and Logan Pass or from St. Mary to Logan Pass. There would also be demand to use visitor transportation services between Lake McDonald Lodge and Logan Pass and Rising Sun to Logan Pass. Consequently, if users were charged a fee, a graduated fee schedule would have to be developed such as used by GPI at the present time.

Generally at the higher loading levels, the capacity of the system met or closely met the projected demands. No system will operate at a 100 percent occupancy level. Administration and overhead were held at 20 percent of operation and maintenance costs for all system sizes. The administrative costs probably would not be much higher for operating a system hauling 26,000 passengers than for accommodating 13,000 passengers.

An actual operating schedule would have to be flexible. If 30-minute headways attracted only minimal passenger loadings in July and August, one-hour headways could be used for longer periods on days when ridership might be lower due to weather. However, reducing frequency would reduce convenience for potential riders, who might decide to use private vehicles if buses were not frequent enough to provide convenient service.

Some conclusions pertaining to visitor transportation services on Going-to-the-Sun Road include the following:

> Lower ridership levels (13,000 to 19,000 per season) would probably occur if there were no additional private vehicle use restrictions on Going-to-the-Sun Road and if the system was operated on a voluntary use basis only. Perhaps even lower levels might occur if 1-hour rather than ½-hour headways were used.
>
> When ridership approached 40,000 per season, costs per user would not appreciably decrease with higher load levels. A system accommodating 26,000 passengers per season would probably cost 25 percent more than one hauling 13,000 passengers.
>
> When ridership approached 30,000 to 35,000, a 25-passenger vehicle would be more cost-effective to operate than a 15-passenger vehicle.
>
> A system hauling 20 percent or approximately 120,000 to 140,000 of the visitors on Going-to-the-Sun Road would appreciably reduce congestion levels on the roadway. This would reduce vehicular traffic by about 100-110 vehicles during high-use hours. A system hauling 40,000 passengers per season would reduce vehicular congestion by about 35 vehicles per high-use hour. Ridership levels at 18,000 to 20,000 passengers per season would do little to reduce congestion on Going-to-the-Sun Road.
>
> It appears that any park public transit system would require subsidization even with user fees and high ridership levels. Trip miles are extensive and traveling speeds are low, requiring high equipment operation and labor costs.

Table 15: Annual Passenger Loadings and Bus Operation Costs
West Glacier to St. Mary/St. Mary to West Glacier

Size of Vehicle and Level of Passenger Loading	Total Round-Trip Passenger Capacity	Forecast Round-Trip Passengers	Miles	Operation Time (hrs)	No. of Buses/Day Average	No. of Buses/Day High Use	Total Annualized Costs	Cost/User Round-Trip	Cost/Mile
Maximum load 25-passenger bus	42,100	26,550	202,080	23,712	18	18	$557,123	$20.98	$2.76
Maximum load 15-passenger van	29,565	26,550	236,520	26,755	18	23	$532,232	$20.05	$2.25
70% of maximum load* 25-passenger bus	26,850	18,590	128,880	13,488	10	11	$342,099	$18.40	$2.65
70% of maximum load 25-passenger bus	42,100	18,590	202,080	23,712	18	18	$557,204	$29.97	$2.76
70% of maximum load 15-passenger van	25,410	18,590	203,280	23,824	18	18	$456,860	$24.58	$2.25
50% of maximum load* 25-passenger bus	26,600	13,265	127,680	13,376	10	10	$331,406	$24.98	$2.60
50% of maximum load* 15-passenger van	16,830	13,265	134,640	14,026	10	12	$292,484	$22.05	$2.17
Alternative C*** 50% of maximum load 15-passenger van	25,260	13,265	202,080	23,712	18	18	$465,250	$35.07	$2.30
50% of maximum load 14-passenger red bus	23,576	13,265	202,080	23,712	18	18	$466,162	$35.14	$2.31
30% of maximum load 10-passenger van	16,840	7,910	202,080	23,712	18	18	$448,872	$56.75	$2.22

---

* One-hour headways for total season

**Presumes no extra trips or buses for high-use periods; all other scenarios included time for two dispatchers only, one included for A and B. The forecast loading assumed 60 and 75 percent occupancy of seats for the season for A and B respectively.

***Alternative C also includes a route from St. Mary to Many Glacier. To maintain comparability between options, data on a route from St. Mary to Many Glacier has not been incorporated into this table. For information on that route, readers should refer to table 16.

Size of Vehicle and Level of Passenger Loading	Total Round-Trip Passenger Capacity	Forecast Round-Trip Passengers	Miles	Operation Time (hrs)	No. of Buses/Day		Total Annualized Costs	Cost/User Round-Trip	Cost/Mile
					Average	High Use			
50% of maximum load Veh. size restrictions 25-passenger bus	46,525	41,125	223,320	25,956	18	19	$605,021	$14.71	$2.71
50% of maximum load Veh. size restrictions 15-passenger van	45,585	41,125	364,680	38,660	28	34	$787,013	$19.14	$2.16
Highest load 25-passenger bus	136,450	123,670	654,960	68,440	49	62	$1,746,904	$14.13	$2.67
Highest load 15-passenger van	136,675	123,670	1,025,400	110,824	80	103	$2,247,605	$18.17	$2.19
Alternative A** 15-passenger van Two-hour headways	9,120	5,470	72,960	7,296	6	6	$158,400	$28.96	$2.17
Alternative B** 15-passenger van Four-hour headways	4,560	3,420	36,480	3,648	3	3	$84,491	$24.70	$2.32

Table 16: Annual Passenger Loadings and Bus Operation Costs
Many Glacier to St. Mary/St. Mary to Many Glacier

Size of Vehicle and Level of Passenger Loading	Total Round-Trip Passenger Capacity	Passengers	Miles	Operation Time (hrs)	No. of Buses/Day		Total Annualized Costs	Cost/User Round-Trip	Cost/Mile
					Average	High Use			
70% of maximum load 25-passenger bus*	24,700	13,955	47,424	5,472	4	4	$130,409	$ 9.38	$2.76
70% of maximum load 15-passenger bus*	16,575	13,955	53,040	7,131	4	5	$130,459	$ 9.35	$2.46
Alternative C 50% of maximum load 15-passenger bus*and**	14,820	10,010	47,424	5,472	4	4	$107,666	$10.76	$2.27
30% of maximum load 10-passenger bus*	9,880	5,995	47,424	5,472	4	4	$106,360	$17.74	$2.24

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*One-hour headways

**This option has been incorporated into alternative C. The data presented in this table is only for the St. Mary-Many Glacier component of that alternative. For additional information on alternative C, refer to table 15.

The various passenger loading options and costs are shown in table 16 for Many Glacier to St. Mary routes. The cost per mile to operate the system is estimated to be slightly higher than West Glacier to St. Mary because of the need for higher ratios of relief drivers to regular drivers for full seven-day service and the higher ratio of standby vehicles to scheduled service buses. The 50 percent of maximum design load with an increased restriction on oversize vehicles option was not analyzed for this route because private vehicle size is not a problem on this route and vehicular volumes are lower than on Going-to-the-Sun Road.

This analysis also indicates that as ridership became higher, larger vehicles would be more cost-effective as related to cost per user. This system, using a 15-passenger modified van with 13 trips per day for the whole season at the 50 percent of maximum load level, is estimated to cost $105,000 to $115,000 per year to operate.

Support Facilities

As mentioned earlier, there are needs for dormitory facilities and a maintenance facility to support a shuttle system. These needs are based on a system and schedule described for alternative C using 15-passenger buses (or 25-passenger buses). Dormitory facilities would be required at West Glacier and St. Mary because shuttle trips would originate from both locations during the operating season. It is estimated that 24 beds (12 rooms) would be required at West Glacier for drivers, and 30 beds (12 rooms) at St. Mary for drivers, dispatchers, and mechanics.

Alternative C was selected as the basis for computing size of support facilities because the level of service in alternative C provides frequent service and flexibility to the rider. The annual ridership levels may be attained with some additional restrictions on the length of the vehicles driving over Logan Pass. Smaller support facilities are described for alternatives A and B. (See the "Description of the Alternatives" section for more information on the alternatives.)

The support facility needs and costs detailed in appendix A are general in nature. Additional need and cost refinements would be required before implementation. If these needs and costs are added to the annualized costs of the visitor transportation system for the St. Mary to West Glacier route, as described in alternative C, using the 50 percent of maximum load levels for 15-passenger vans with ½-hour headways in July and August, and a St. Mary to Many Glacier route, total annual costs would be from $700,000 to $735,000 per season.

Parking Demand Generated by a Visitor Transportation System

Various levels of parking demand would be generated based on passenger load levels. Passenger loading areas would be at designated trailheads, campgrounds, and developed areas. At campgrounds and trailheads, passengers would most generally walk to and from a shuttle bus stop, but at specific developed areas, staging/parking areas would be required for drivers to park their vehicles for the duration of a shuttle trip.

It is expected that a major staging/parking area would be required in the West Glacier area. The most desirable location would be at the proposed visitor center. In a draft environmental assessment for revisions to the *Apgar Headquarters Development Concept Plan* (NPS 1981), a new visitor contact station/center is shown in two possible locations between the existing

headquarters areas and the intersection of Camas and Going-to-the-Sun roads. A visitor center/staging area could also be constructed outside the park near West Glacier. This facility could be constructed cooperatively with the U.S. Forest Service, as discussed in the late 1970s and at present. A parking/staging area for the visitor transportation system could be sited with the parking area required for the visitor center.

The following forecasts were made using a maximum daily passenger round-trip loading of about 40,000 per season (620 per day in August) on Going-to-the-Sun Road. Based on traffic volumes and locations of campgrounds on Going-to-the-Sun Road, it was presumed that 60 percent of the 620 passengers would be originating on the west side and 40 percent on the east side.

From traffic volumes, peak-hour traffic volumes amounted to nearly 17 percent of average daily volumes from Rising Sun to Lake McDonald Lodge. Applying this ratio to peak-hour bus loadings and consequent parking demand, about 105 passengers per hour would approximate peak-hour demand in August. Since it does not appear feasible to size staging areas for single peak-hour demand, the peak-hour parking demands were multiplied by 0.93 to identify high-use day demands. The average of the fourth and fifth high-use hours on weekends amounted to approximately 93 percent of the peak hour during the summer.

Table 17 shows the presumptions and forecasts used to project parking space demand for staging areas along Going-to-the-Sun Road. The table indicates that the largest demand would be at the West Glacier visitor center (74 spaces) and the St. Mary visitor center (42 spaces). This is presuming that drivers could also park their cars at Apgar Village, Lake McDonald Lodge, and Rising Sun. A new visitor center in the West Glacier area would also generate parking needs for private drivers not using the visitor transportation system. The existing developed areas currently contain parking areas. Approximately 1.5 acres should be added to the 1.3 acres projected for visitor transportation system passengers at the new visitor center.

If a route were added between St. Mary to Many Glacier, 35 additional spaces would be needed at Many Glacier assuming that 70 percent of the shuttle passengers would also ride the Going-to-the-Sun Road shuttle to Logan Pass. The estimated demand at St. Mary for shuttle riders to Many Glacier amounted to 24 additional spaces. This is based on the assumption that 70 percent of the passenger loadings would be attained from table 16, and that 90 percent of the visitor transportation system riders would drive vehicles to the staging area at both St. Mary and Many Glacier. If both systems were in service, the total parking demand for the visitor transportation system at St. Mary is estimated to be 66 spaces (24 + 42).

Table 17: Projected Parking Space Demand/Visitor Transportation System
West Glacier to St. Mary

	West Side		East Side
Passengers	59		39
Passengers arriving by vehicle[1]	47		31
Vehicles to be parked[2]			
West Glacier	10	St. Mary visitor center	7
Apgar Village	2	Rising Sun	4
Lake McDonald Lodge	5		
	17		**11**
Parking spaces needed[3]			
West Glacier	74	St. Mary visitor center	42
Apgar Village	15	Rising Sun	23
Lake McDonald Lodge	23		
Additional acres needed for parking[4]			
West Glacier visitor center	1.3	St. Mary visitor center	.7
Apgar Village	.3	Rising Sun	.4
Lake McDonald Lodge	.5		

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[1] 80 percent of passengers arrive by vehicle, 20 percent walk to shuttle stops from campgrounds, lodging, and trailheads.

[2] 9 persons/vehicle - 60% at West Glacier VC, 10% at Apgar Village and 30% at Lake McDonald Lodge on the west side, 66% at St. Mary and 34% at Rising Sun on the east side

[3] Computed from total trip time to destinations from West Glacier and St. Mary resulting in total parking turnover time

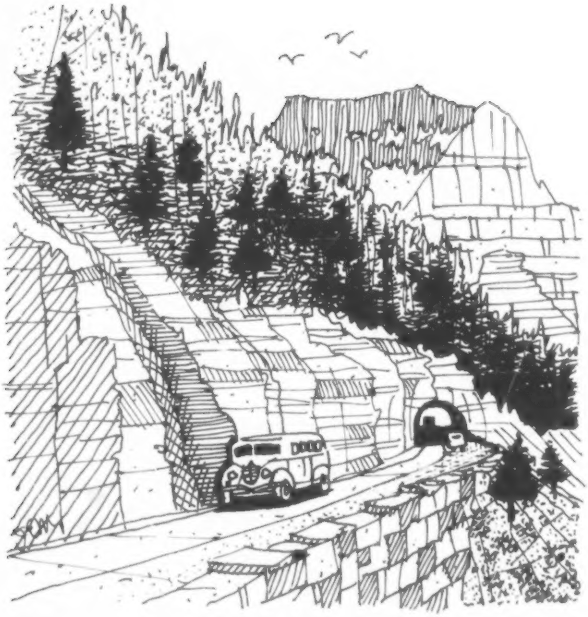
[4] 60 spaces per acre

Funding for Visitor Transportation Systems

If possible, a new visitor transportation system should be self-supporting and operated at no cost to the federal government; instead, the private sector should own and operate the system. Some existing systems are funded by user fees, increases in visitor rates for a variety of goods and services supplied by a concessioner, and by annual appropriations. In some instances, a combination of user fees and annual appropriations are used simultaneously.

Enforcement or entrance fees can be used for protection of natural and cultural resources and maintenance activities related to protection of these resources as well as research and interpretation. An interpretation of the use of these funds indicates that if a strong case can be made to protect resources, perhaps these fees can be used to assist in funding a visitor transportation system.

DESCRIPTION OF ALTERNATIVES



As previously discussed in the "Summary" section, this *Draft Transportation Plan/ Environmental Assessment* provides alternative strategies for dealing with traffic and transportation issues related to Going-to-the-Sun Road and some secondary roads and turnouts within Glacier National Park. Four alternatives, including no-action and a preferred alternative, have been developed. Each alternative includes strategies for road rehabilitation, implementation of a public transit system, and traffic management. A conceptual comparison of these alternatives is shown in table 19 and a comparison of changes in roadway widths by section is shown in table 20.

Treatments for Packers Roost and Camas roads, the Sun Point intersection, and 130 turnouts on Going-to-the Sun Road are also proposed along with treatment of a historic quarry operation. All proposed actions are analyzed for their beneficial and adverse effects on visitor use and the environment and their cumulative impacts on cultural resources in the "Environmental Consequences" section.

Alternatives for other major park roads (Many Glacier Road, Two Medicine Road, Chief Mountain Highway) are not presented in this report because further geotechnical and planning studies are required before formulation of road options. Road options for the North Fork area will be analyzed in the development concept planning effort currently underway. Because the Cut Bank Road is in generally good condition, no actions other than normal maintenance are proposed during this planning effort.

For analysis purposes, Going-to-the-Sun Road has been divided into the same road sections as it was in the *Road Rehabilitation Planning Study* prepared by the Federal Highway Administration (FHWA 1984). These road sections were previously described in the "Road and Traffic Analysis, Roadway Characteristics" section. The recent improvements to road section 1 and proposed changes to section 2 were described in the same section of this document.

NO-ACTION ALTERNATIVE

The no-action alternative would be a continuation of present management and use patterns. There would be no rise in elevation of the road, and geotextile fabric would be used to prevent groundwater filtration. In the 2 to 3 miles of road with subbase problems, digouts to a possible maximum of 3 feet would be performed and new material would be added. On the remainder of the road, the existing roadway width would be retained with no drainage modifications. The park maintenance division would continue to repair and patch the failing sections of Going-to-the-Sun Road. Vista clearing would continue in accordance with the approved vista clearing plan. Maintenance crews would also continue sight-distance and ditch clearing. Stone parapets would continue to be repaired or replaced with new wood and steel guardrails on a case-by-case basis.

All existing turnouts and slow-vehicle pullovers would be retained under the no-action alternative. Road maintenance crews would repair potholes, cracks, and other problems as they arose.

Significant expansion of the concessioner's bus system or regularly scheduled shuttle bus service would not be considered under the no-action alternative.

Existing management restrictions on vehicle size and length would continue to be enforced in an attempt to reduce congestion on Going-to-the-Sun Road. These restrictions were described in the "Road and Traffic Analysis, Park Traffic Restrictions" section.

ALTERNATIVE A (Preferred Alternative)

In planning for Going-to-the-Sun Road, the historic character and significance of the road, the quality of the visitor experience, and visitor safety were all important considerations. The road is on the National Register of Historic Places because it exemplifies a major engineering feat of early road building and because it is identified with the automobile tourist. The alignment, road width, stone walls, parapets, culverts, bridges, and C-shaped tunnels are all significant features of the road.

Driving the historic road has always been central to the visitor experience at Glacier. The road is known for its spectacular scenery and for its narrow width, steep vertical walls on one side, and steep vertical drop-offs on the other. These characteristics produce the white-knuckle driving experiences for which the road is famous and necessitate low travel speeds to negotiate the road and enjoy the drive and the scenery.

Altering the 1930s Going-to-the-Sun Road to meet modern highway standards would require replacing the historic stonework, constructing higher steel-reinforced concrete walls, widening the road, and straightening the alignment to enable safe travel at higher speeds. Because these changes woud destroy the historic character of the road and the associated visitor experience, major moderizing improvements were not considered in this plan.

The preferred alternative would retain the historic alignment and call for little widening or removal of rock in the travel corridor. The stone walls would be treated as prescribed in the *Cultural Resources Plan, Going-to-the-Sun Road* (CRP). Walls in some sections of the road would be repaired and their historic appearance maintained. In other areas new walls would be built to meet modern safety standards; these walls would be designed to blend with the historic features. Visitors would be warned that the road is historic and built to the standards of another era – that it does not meet modern standards and therefore requires cautious driving.

To reduce traffic congestion and provide alternative means of travel on the road, Glacier Park, Inc., would expand their bus operations to include a park shuttle bus system or a private business would be contracted to operate such a system. Traffic management options would also be implemented.

The preferred alternative would retain the historic character of the Going-to-the-Sun Road and the traditional driving experience while improving safety and providing options for travel by shuttle bus. The actions to improve safety would not bring the road to modern standards. Visitors who chose to make this trip would continue to exchange the relative ease of driving on a modern highway for the unique experience that this one-of-a-kind road provides.

Going-to-the-Sun Road Modifications

Section 3 (Lake McDonald ranger station road to 0.44 mile north of Logan Creek Bridge). The roadway would be rehabilitated with bituminous plant-mix overlay and no shoulders would be widened in this 8.97-mile segment. The project would involve excavation and replacement of surfacing and paving in areas of severe roadway distress or subgrade failure. This work, together with a preleveling course and bituminous plant-mix overlay, would restore riding qualities and extend the service life of the roadway. Selective thinning and clearing of vegetation on roadside areas would improve sight distance.

There would be minor disturbance on roadway cut-and-fill slopes, if subdrainage pipes are needed, and there would be limited changes on the drainage characteristics of the roadside ditches. The surface width might be narrowed by up to 2 feet in some areas because of the grade rise resulting from the preleveling course and overlay. The final paved top width would average 22 to 24 feet, although 3.36 miles, or 37 percent of the total section, would be as narrow as 20 feet. Preparation of an adequate road base would raise the road and, because the road is narrower in that section, the effective top width would be decreased. The 2.1 miles of road in this section that was rebuilt in 1965 to a width of 28 feet (1.2 miles near Sacred Dancing Cascade and 0.9 mile from the north end of this section) would be retained. This alternative would retain the historically significant structures at North Cannon Creek, Avalanche Creek, and Logan Creek with little or no change in roadside or drainage characteristics. Because the hydraulic capacity of the Logan Creek Bridge is inadequate, the channel under the bridge would be cleaned periodically to avoid loss of the structure. Logs and rocks are currently removed about once every 10 years. The narrow, hazardous North Cannon Creek Bridge would be widened.

Section 4 (0.44 mile north of Logan Creek Bridge to west portal of West Side Tunnel). In section 4 subbase failures would be excavated and resurfaced. Roadway embankments would be stabilized and rebuilt, and drainage would be corrected in three areas where roadway embankments are failing. The first two embankment failures (milepost 21.74 to 21.80 and milepost 23.13 to 23.17) are relatively minor and would be generally reconstructed to the original slopes. If cost effective, retaining walls might be used to reduce fill requirements. The third location (milepost 23.73 to 23.84) near the west portal of the West Side Tunnel is a massive localized slump caused by over-steepening the original roadway embankment. Approximately 50,000 cubic yards of common-borrow material would be required to reconstruct and stabilize this embankment (retaining walls might be used to reduce the borrow requirements) to restore the integrity of the roadway. The amounts of cut and fill are estimates. Actual amounts will be determined during the design process. After stabilization, the roadway would be preleveled, and the pavement would be overlain with bituminous plant-mix. Guardrails might be required for the steep, slope-failure areas that are proposed for reconstruction. The existing two-barrel, box culvert at Alder Creek would be retained. No rock-face removal would occur.

No roadway or ditch widening would be provided under this alternative. Because of the depth of overlay, the effective paved top width of the roadway and pavement would be reduced from 22 feet to 20 feet in the entire section. Selective vegetation thinning and clearing is proposed along the roadway.

This alternative would require a major common-borrow source to generate 30,000 to 50,000 cubic yards of borrow material. The needed material would be reduced if retaining walls or crane-placed rock fills were constructed.

Section 5 (west portal of West Side Tunnel to Logan Pass). The existing 19- to 24-foot-wide paved surface in this section would be retained. None of the historic structures in this section (West Side Tunnel, Haystack Creek Amphitheater Bridge, or Triple Arch Bridge) would be modified.

Only minor rock-face removal (10 cu. yds.) would occur, and only when these surfaces protruded into the traveled way above the actual driving surface of the roadway. No removal would be undertaken to obtain lateral clearance beyond the existing traveling surface.

Other work would include stabilization of the masonry wall at the Loop. This is a problem which, if not solved, would result in the collapse of the hand-placed, rubble-masonry retaining wall, overlying stone parapet, and failure of about 100 feet of roadway in the switchback turn. Recent test drillings indicate that the existence of voids within the coarse-rock embankment and the migration of fine material into these voids is the probable cause of both roadway and wall settlement. Remedial measures would enlarge and extend the subsurface and surface drainage system, repair and stabilize the rubble-masonry retaining wall and parapet, and resurface and pave the roadway.

The low stone parapets would be repaired and the height increased. Other poor-condition stone parapets would be removed and replaced in kind. New stone parapet would be constructed to fill in short gaps between existing stone parapets along the roadway or around turnouts. Additional new, removable guardrail needed in some sections would be designed to meet current safety and crash standards. A guardrail/wall plan would be prepared by the park to identify detailed shoulder treatments for each segment of the roadway.

Drainage would be improved and the pavement would be rehabilitated. The elimination of the roadside ditch to widen the roadway has created the need for additional cross-highway culverts and catch basins. Some partially crushed culvert pipes need replacement. A substantial number of culvert inlets present a hazard to bicyclists, pedestrians, and motorists. Some culvert inlets need to be better protected so that no entrance is possible, and some drains are too wide for bicycle tires to cross safely. Installation of protective barriers and traversable, flush-mounted, metal gratings is proposed; additional designs to meet safety and aesthetic standards would be developed during the design stage.

Section 6 (Logan Pass to St. Mary Falls trailhead). In section 6, shoulders would be stabilized in four areas; safety characteristics would be improved through the installation of removable guardrails; stone-masonry parapets and other stone-masonry structures would be repaired and extended; and pavement deterioration would continue to be prevented by using periodic seal coats. The roadway would not be widened beyond the existing 22 to 23 feet. No changes would be made to the historic East Side Tunnel.

Retaining walls would be constructed as a means of stabilizing the four areas of shoulder and embankment failure. Areas where the shoulder erosion is narrowing the roadway are (1) milepost 33.03 to 33.07, (2) milepost 33.10 to 33.17, (3) milepost 33.34 to 33.37, and (4) milepost 33.41 to 33.46. Stabilization of these areas would require the construction of about 1,000 linear feet of retaining walls ranging from approximately 6 to 8 feet in height. Retaining-wall construction could be done with stone masonry, stone-masonry-faced concrete, or stone-filled gabion baskets. Several damaged, rubble-masonry waterways would be repaired and replaced, and drainage gutters along the road edge would be reconstructed.

Section 7 (St. Mary Falls trailhead to Rising Sun). Work proposed for this section would include the repair of base-failure areas and improvement of parapets and guardrails. An overlay that retained the existing 22-foot-wide paved surface would also be provided. Surface failure areas would be dug out and repaired. The road would be preleveled and overlain with bituminous plant-mix. Removable guardrails and new stone parapets would be constructed, and some stone parapets would be repaired. Selective sight-distance clearing would be done as necessary. No changes would be made to the historic Sunrift Gorge Bridge.

Section 8 (Rising Sun to US 89 junction). The road would be preleveled and base failures replaced. A plant-mix overlay would be applied, but there would be no change in the existing 22-foot-wide paved surface. The west abutment of the Rose Creek Bridge that has been undermined and displaced during high water would be repaired. Although it is temporarily stable, additional high water could cause progressive damage or possible total failure of the structure. The historic St. Mary River Bridge would be retained.

If feasible, a new bridge of similar appearance to the existing historic bridge would be constructed over Divide Creek to increase hydraulic capacity. No channel modifications are proposed under this alternative.

Public Transportation

Under alternative A, GPI would be offered the right to expand its bus operations to include a limited, park shuttle bus system. If GPI declined, the Park Service would contract, through a request for proposals, with a private company outside the park to implement a public transit system within the park. The selected company would operate under a concession permit or contract on a trial basis to see that they met NPS standards and objectives (e.g., fees, routes, number of people transported, size and type of vehicles, designated stops). A long-term contract or concession permit would be initiated within a few years if the bus system was acceptable. Commercial use licenses or operating authority for one or two private firms outside the park would be sought from the state and Interstate Commerce Commission to operate a limited regional public transportation system to the park. This external system would be closely coordinated with the park shuttle bus system and GPI's existing bus operations to ensure maximum service to park visitors.

The Going-to-the-Sun Road shuttle bus system would require six new (four plus two standbys) 15-passenger buses/vans (maxi-van modified to enhance views and provide luggage racks). The buses would operate every two hours from 6:00 a.m. to 11:00 p.m. during the operating season. Buses would depart from West Glacier and St. Mary starting at 6:00 a.m. and 8:00 a.m. respectively and ending at 9:00 p.m. and 11:00 p.m. This service would require 12 (eight plus four standby) drivers and would provide a maximum passenger capacity of 9,120 round-trip or 18,240 one-way trip passengers for a 76-day season. Demand would probably exceed capacity during the middle of the day; however, it is nearly impossible to achieve 100 percent occupancy for a total operating day. The early buses might not be filled and poor weather could reduce ridership. Specific bus fares low enough to encourage sufficient ridership would be negotiated with GPI. Interpretation of the park's natural and cultural resources could be provided on the bus by the drivers or park interpretive staff.

The buses would stop at major trailheads and scenic areas, including Sacred Dancing Cascades, Sperry Chalet trailhead, Avalanche Creek, the Loop, Logan Pass, Siyeh Bend, Jackson Glacier overlook, St. Mary Falls, Sunrift Gorge, and Sun Point. Major developed areas visited would be West Glacier, the proposed west side visitor center, Fish Creek campground, Apgar village, the Apgar and Sprague Creek campgrounds, Lake McDonald Lodge, Rising Sun, St. Mary visitor center, and St. Mary village. The largest estimated parking/staging demand would occur at West Glacier (16 spaces) and St. Mary (9 spaces), with some additional parking required at Apgar (4 spaces), the Lake McDonald Lodge area (6 spaces), and Rising Sun (5 spaces).

The annual operational costs for a 76-day season would range from $157,000 to $162,500, including amortization of the vans, but without support facilities and no extra service for peak hours or high-use days. Minor or routine services for the buses might be obtained from existing automotive service facilities at West Glacier or St. Mary in the summer. Support facilities would include four-room dormitories at St. Mary and West Glacier.

The initial capital costs for the support facilities (dormitories) would be $326,000, and the annual costs for these structures would be approximately $36,200. The total annual cost of the bus system with the dormitory facilities would range from $190,000 to $200,000. Specific bus fares low enough to encourage sufficient ridership would be negotiated with GPI or the private operator.

Traffic Management

The following actions are proposed to better manage traffic on Going-to-the-Sun Road:

> Advise park visitors through education, interpretation, and private sector advertisement of the congestion problems on Going-to-the-Sun Road and the optimal times to traverse Logan Pass. Information pamphlets, road signs, and education and interpretive programs could all be used to apprise visitors of the traffic situation. The peak congestion period for Logan Pass (10:00 a.m. to 4:00 p.m.) could be publicized in the local news media and in brochures by the bureaus of state tourism and local chambers of commerce. This would allow visitors to plan their trips to avoid congested periods.
>
> Encourage a portion of the park visitors to make a loop trip through and around the eastern and southern portions of the park via Going-to-the-Sun Road, US 89, State Route 49, and US 2. The park could promote such a loop trip to the visitors at the entrance stations, visitor centers, amphitheaters, and in brochures. This trip could be made even more attractive with the addition of pullouts with wayside exhibits interpreting the Blackfeet Indian Reservation and the ecology and geology of the area. This effort would have to be closely coordinated with the Blackfeet Tribe, the Federal Highway Administration, and the Montana Department of Transportation regarding road maintenance and law enforcement. This would eliminate some traffic on Going-to-the-Sun Road and would allow visitors to see more of the park and surrounding area.
>
> Actively promote travel to the park by a regional public transportation system. The park would have to coordinate closely with management staffs of local businesses transporting people to the park (regional bus systems such as Intermountain Transportation Company, Brown Lines, Inc.); airlines such as Delta that fly into Kalispell and Great Falls; and Amtrak to advertise and promote relatively inexpensive

package tours to the park. The bureaus of state tourism, local chambers of commerce, and local media could be encouraged to assist in this promotion.

Limit the number of vehicles driving over Logan Pass during peak-use periods (such as 10 a.m. to 4:00 p.m.) on high-use days, and if congested conditions continued to occur during the high-use summer months. Once these restrictions were imposed, they would remain valid for the entire season. The park staff would monitor for traffic breakdown (stop-and-go traffic with unacceptable delays), increased adverse effects on natural resources due to overuse, or a serious increase in accident rates indicating an unacceptable safety hazard on Logan Pass. When this traffic breakdown occurred on a regular basis, the volume of traffic in both directions would be noted. When the hourly volume approached the breakdown value, the staff at Logan Pass would notify park personnel at two checkpoints on either side of the pass to initiate a traffic-volume control process. These checkpoints would be at Lake McDonald Lodge on the west and Rising Sun on the east. As one vehicle left the checkpoint, another would be permitted to enter toward the pass. This system would require an electronic loop counter and personal computer or a counter with a built-in printer at Logan Pass and a staff person to observe the printer or computer screen at regular intervals. A second similar operational procedure would be to use a traffic-metering method such as allowing one vehicle per period of time to enter the pass sections (i.e., one vehicle per 10 seconds from each site). Monitoring one car every 10 seconds from each site could also be done by using a staff person at each site rather than a computer. This would be initiated when the breakdown volumes were approached, based on the capacity of the roadway west of Logan Pass.

In addition to the above options, a 20-foot-length restriction on vehicles over Logan Pass would be imposed. Automobiles, most pickup trucks with campers, small recreational vehicles, and vans could continue to traverse Logan Pass without restriction. Midsize and larger recreational vehicles and motor homes and the largest pickup campers would be restricted. Visitors would be notified of this situation through the news media and bureaus of state tourism before arrival at the park and at park entrance stations. Larger vehicles would be measured at the entrance stations. Visitors in greater than 20-foot-long vehicles would be advised of the situation and presented with the option of detouring south of the park to gain access to the east-side park facilities and roads or they could use the transportation system. Random, vehicle-length checks by park rangers would be conducted in lower sections of the restricted zone for peak times of the day (10:00 a.m. to 4:00 p.m.) on weekends and holidays. If congested conditions continued to occur on Logan Pass, an all-day vehicle-length restriction would be implemented for the peak months of the summer.

ALTERNATIVE B

Under this alternative, Going-to-the-Sun Road would be widened in sections 3, 4, 7, and 8, to 24 feet with 1-foot, stabilized-turf shoulders where possible. Rock protrusions into the traveled way above the driving lanes would be removed in sections 4 and 5. GPI would expand their bus operations to include a park shuttle bus system or a private business would be contracted to operate a shuttle bus system. The traffic management options would be implemented when traffic congestion conditions worsened.

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Going-to-the-Sun Road Modifications

Section 3 (Lake McDonald ranger station road to 0.44 mile north of Logan Creek Bridge). This section would be rehabilitated with bituminous, plant-mix overlay, and several sections and some shoulders would be widened. The project would involve excavation and replacement of surfacing and paving in areas of severe roadway distress or subgrade failure. This work, together with a preleveling course and bituminous plant-mix overlay, would restore better riding quality and extend the service life of the roadway. This work would be predicated on soil survey and design. Selective thinning and clearing of vegetation on roadside areas would improve the sight distance.

The original roadway would be widened in a few sections to retain the 24-foot-wide paved surface in those areas where required raising of the grade during the preleveling course and overlay would otherwise reduce the existing width to 22 feet. This includes areas from milepost 14.23 to 15.36 and from milepost 18.84 to 21.07, a distance of 3.36 miles and 37 percent of the section length. About 12,000 cubic yards of excavation and 2,000 cubic yards of topsoil would be required to construct a 24-foot roadway with turf shoulders in critically narrow sections. As noted under alternative A, over 2 miles of this section of road were rebuilt in 1965 to a width of 28 feet.

The historically significant structures at North Cannon and Avalanche creeks would be retained, with little or no change in either roadside or drainage characteristics. Because the hydraulic capacity of the Logan Creek Bridge is inadequate, the channel under the bridge would be cleaned periodically to avoid loss of the structure. Logs and rocks are currently removed about once every 10 years. The narrow, hazardous North Cannon Creek Bridge would be widened.

Section 4 (0.44 mile north of Logan Creek Bridge to west portal of West Side Tunnel). This section of roadway would be reconstructed with minor alignment improvements to obtain a 24-foot-wide paved surface. The widening would require excavation of roadway-cut slopes beyond existing roadside ditches. Drainage would be corrected and failing embankments would be stabilized. Excavation amounts would be about 36,000 cubic yards. The two-barrel, box culvert at Alder Creek would be replaced with a new structure of greater hydraulic capacity and increased roadway width. The roadside vegetation would be thinned selectively and cleared to improve sight distance.

Another portion of the project would involve delicate "rock surgery" to remove rock protrusions into the traveled way above the present driving lanes. The average width of intermittent excavation would be about 1 foot. The height of the excavation would range from 0 to 15 feet. The estimated quantity of excavation would be 100 cubic yards. Some of the removed material is expected to be good quality quarry stone that is badly needed for wall and parapet construction and repair. Protective mats would be placed over stone parapets and other structures to prevent damage during blasting operations. Work would be performed at night or after Labor Day weekend to avoid conflicting with visitor use. Removal of the rock protrusions would provide a clear, 20-foot width through most of the section.

A major common-borrow source would provide 30,000 to 50,000 cubic yards of material for construction and stabilization of failing roadway embankments. An additional 31,000 cubic yards would be necessary because of the roadway widening.

Section 5 (west portal of West Side Tunnel to Logan Pass). The existing 19- to 24-foot-wide paved surface in this section would be retained. None of the historic structures in this section (West Side Tunnel, Haystack Creek Amphitheater Bridge, or Triple Arch Bridge) would be modified.

As described in section 4, a portion of the project would involve delicate "rock surgery" to remove rock protrusions into the traveled way above the present driving lanes. The estimated quantity of excavation in section 5 would be 885 cubic yards. Some of the removed material is expected to be good quality quarry stone that is badly needed for wall and parapet construction and repair. Protective mats would be placed over stone parapets and other structures to prevent damage during blasting operations. Work would be performed at night or after Labor Day weekend to avoid conflicting with visitor use. Removal of the rock protrusions would provide a clear, 20-foot width through most of the section.

Other work would include the stabilization of the masonry wall at the Loop as described under alternative A.

Guardrail, drainage, and pavement rehabilitation work would be accomplished as described under alternative A.

Section 6 (Logan Pass to St. Mary Falls trailhead). The work proposed for this restricted pass portion of the road would be the same as described under alternative A.

Section 7 (St. Mary Falls trailhead to Rising Sun). The road would be reconstructed on the existing alignment by clearing, grading, extending, and adding culverts. The road would also be widened, surfaced, and paved to obtain a 24-foot paved top width. Because of the narrow geometrics of this highway section, it would be necessary to regrade the roadway ditches and backslopes to obtain this width. The amount of excavation necessary is estimated to be about 60,000 cubic yards, and all roadway shoulders and ditches would be affected.

New, removable guardrails and new stone parapets would be constructed, and some existing stone-masonry parapets would be repaired. Selective thinning and clearing of vegetation would be done as necessary to improve sight distance. The historic Sunrift Gorge Bridge would be maintained in its existing condition.

Section 8 (Rising Sun to US 89 junction). Under this alternative, the existing road would be widened by clearing, grading, extending, and adding culverts. The road top would then be surfaced and paved to obtain a 24-foot-wide paved surface. About 30,000 cubic yards would be excavated to obtain this roadway width. Repair work described under alternative A would be performed on the west abutment of Rose Creek Bridge as described under alternative A. The historic St. Mary River Bridge would be retained.

If feasible, a new single-span bridge of similar appearance to the existing bridge would be constructed over Divide Creek to increase hydraulic capacity. No channel modifications are proposed in this alternative.

Public Transportation

Under alternative B, the Park Service would request that GPI provide bus transportation service to pick up hikers at trailheads and developed areas on a scheduled basis (might tie in with the Flathead Valley bus services). Buses would depart from West Glacier and St. Mary every four hours from 7:00 a.m. to 7:00 p.m., with service ending at 10:00 p.m. This would provide campers, trailhead users, and others an opportunity to catch a scheduled bus on Going-to-the-Sun Road.

Three (two plus one standby) additional 15-passenger buses/vans or three existing concessioner buses (if available) would be needed to provide this more frequent service and serve additional stops. This service would also require six extra (four plus two standby) bus drivers. The maximum annual system capacity would be 4,560 round-trip passengers or 9,120 one-way passengers for a 76-day season. As indicated in alternative A, demand would probably exceed capacity during the middle of the day; however, it is nearly impossible to achieve 100 percent occupancy for a total operating day.

As described under alternative A, the buses would stop at major trailheads and scenic areas, including Sacred Dancing Cascades, Sperry Chalet, Avalanche Creek, the Loop, Logan Pass, Siyeh Bend, Jackson Glacier, St. Mary Falls, Sunrift Gorge, and Sun Point. Major developed areas visited would be the proposed west side visitor center, West Glacier, Fish Creek campground, Apgar village, Apgar and Sprague Creek campgrounds, Lake McDonald Lodge, Rising Sun, St. Mary visitor center, and St. Mary village.

Vehicular parking for this shuttle service would be accommodated at West Glacier, St. Mary, Apgar, the Lake McDonald Lodge area, and Rising Sun. Required parking space would be about half of that described for alternative A. It is estimated that 20 parking spaces (13 divided among West Glacier, Apgar village, and Lake McDonald Lodge and 7 at St. Mary visitor center and Rising Sun would be required. Maintenance would be obtained at service stations at West Glacier and St. Mary. No additional building would be added to house the six additional drivers.

The annual operational cost for this service would range from $81,000 to $86,000. Estimated costs include the amortization of three 15-passenger vans. Dormitory and maintenance facilities would not be included so no additional costs would be incurred. Personnel for operating the system would use existing housing.

Traffic Management

Traffic management options would be the same as described under alternative A; however, there would not be any vehicle-length restrictions.

ALTERNATIVE C

Under alternative C, Going-to-the-Sun Road would be widened to 24 feet with 1-foot stabilized-turf shoulders in sections 3, 4, 7, and 8. Rock hazards in sections 4 and 5 would also be removed.

GPI would be offered the option to expand their bus operations or the park would contract, through a request-for-proposals, with a private company to implement a park shuttle bus system with restrictions. Traffic management options identified under alternative A would be implemented if traffic congestion worsened.

Going-to-the-Sun Road Modifications

Roadway rehabilitation and widening would be the same as described under alternative B.

Public Transportation

Operation and contracting procedures for a shuttle bus system would be the same as described under alternative A.

The Going-to-the-Sun Road shuttle bus system would require eighteen 15-passenger buses/vans (16 plus two standby). The buses would operate every hour from West Glacier and St. Mary between 6:00 a.m. and 11:00 p.m. during June and September. During July and August, this bus schedule would be increased to every ½ hour from 9:00 a.m. to 10:00 p.m. The buses would stop at the major trailheads of Sperry Chalet, Avalanche Creek, the Loop, Logan Pass, Siyeh Bend, Jackson Glacier, St. Mary Falls, Sunrift Gorge, and Sun Point. Major developed areas visited would be West Glacier, Apgar visitor center, Apgar, Apgar campground, Lake McDonald Lodge, Rising Sun, St. Mary visitor center, and St. Mary. This service would require 39 (28 plus 11 standby) drivers. A total of 25,260 round-trip passengers or 50,520 one-way trip passengers could be accommodated during an estimated 76-day operating season. As stated under alternative A, 100 percent occupancy could not be obtained for a total operating day; therefore, a 60-percent-occupancy ridership would amount to 15,156 round-trip passengers. If ridership demand increased over 30,000 to 35,000 round-trip passengers per season, a 25-passenger bus would appear to be more cost-effective than the 15-passenger van. Interpretation of the park's natural and cultural resources could be provided on the bus by the drivers or park interpreters.

Under this alternative, a route from St. Mary to Many Glacier would also be included. This route would require four 15-passenger buses (three operational and one stand-by). The buses would operate every hour from 8:00 a.m. to 8:30 p.m. for the entire season. The buses would stop at St. Mary visitor center, St. Mary village, Appekuny trailhead, Swiftcurrent picnic area, Swiftcurrent Motel and Many Glacier Motel. Nine drivers (six plus three standby) would be required. A total of 14,280 round-trip passengers or 28,560 one-way trip passengers could be accommodated during a 76-day operating season. A 60-percent-occupancy ridership would amount to 8,568 round-trip passengers.

Increased parking demands would result from establishment of this system. The largest demands would occur at West Glacier and St. Mary, with some additional parking required at Apgar, the Lake McDonald Lodge area, and Rising Sun. The estimated demands are shown in table 18.

Table 18: Parking Demands – Visitor Transportation System

Location	Low Range[1]	High Range[2]
West Glacier	41 spaces	74 spaces
Apgar Village	9 spaces	15 spaces
Lake McDonald Lodge	13 spaces	23 spaces
Rising Sun	13 spaces	23 spaces
St. Mary	23 spaces	42 spaces

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[1] passenger loading up to 22,000 – 24,000 per year

[2] with implementation of additional vehicle-length restrictions on Going-to-the-Sun Road, passenger loading could increase to 40,000 – 42,000 per year

These estimates are in addition to existing parking demands at the various developed areas. These demands and those described under alternatives A and B are based on system capacities described under each alternative. If a system with a higher capacity was implemented and ridership loads were higher, parking needs would increase correspondingly.

If the concessioner operated the bus system, additional employee housing would be required at Lake McDonald Lodge and Rising Sun. A new bus maintenance area would need to be constructed at St. Mary or West Glacier. Specific bus fares low enough to encourage sufficient ridership would be negotiated with GPI or a private operator.

The annual operational costs for the system under this alternative are estimated to range from $565,000 to $590,000, depending on passenger loading and including the amortization of vehicles. Support facilities would include dormitories at St. Mary and West Glacier and a maintenance facility at St. Mary. The annualized costs for support of the facilities mentioned above are estimated to range from $230,000 to $250,000 per year. The initial capital costs for the support facilities are estimated to range from $2,000,000 to $2,200,000.

Traffic Management

Traffic management options would be the same as those discussed under alternative A.

Table 19: Comparison of Alternatives

	Alternative A (Preferred Alternative)	Alternative B	Alternative C	No-Action
Road Improvements	Rehabilitate road	Rehabilitate road	Rehabilitate road	Repair and patch failing sections only
	Decrease road width in sections 3 and 4; retain existing road width in other sections	Widen road to a minimum of 24 feet with 1-foot stabilized turf shoulders where possible	Same as B	Retain existing width
	Correct drainage problems	Correct drainage problems	Correct drainage problems	No drainage modifications made
	Repair parapets	Repair parapets	Repair parapets	Repair or replace parapets
	Retain existing two-barrel, box culvert at Alder Creek	Replace two-barrel, box culvert at Alder Creek with new structure of similar appearance	Same as B	Same as A
	If feasible, construct new single-span bridge of similar appearance to historic bridge over Divide Creek	If feasible, construct new single-span bridge of similar appearance to historic bridge over Divide Creek	If feasible, construct new single-span bridge of similar appearance to historic bridge over Divide Creek	Retain existing bridge at Divide Creek
		Widen Cannon Creek Bridge	Widen Cannon Creek Bridge	
	Retain rock protrusions in sections 4 and 5	Remove rock protrusions in sections 4 and 5	Remove rock protrusions in sections 4 and 5	Retain rock protrusions in sections 4 and 5
	Implement turnout plan	Implement turnout plan	Implement turnout plan	Retain existing turnouts
Public Transportation	Provide transit service every 2 hours from 6 a.m. to 11 p.m. System capacity would be 9,120 round-trip passengers.	Provide transit service every 4 hours from 7 a.m. to 10 p.m. System capacity would be 4,560 round-trip passengers.	Provide transit service every hour from 6 a.m. to 11 p.m. in June/September. Increase in July/August to every half hour between 9 a.m. and 10 p.m. System capacity would be 25,260 round-trip passengers. Provide transportation service from St. Mary to Many Glacier every hour from 8:00 a.m. to 8:30 p.m. System capacity would be 14,820 passengers.	Retain existing concession bus operation Retain concessioner's bus system or regularly scheduled shuttle bus

	Alternative A (Preferred Alternative)	Alternative B	Alternative C	No-Action
Public Transportation (cont.)				
Annual operational costs (initial bus cost included)	$157,000-162,500	$81,000-86,000	$460,000-480,000	
Annual operational cost for St. Mary to Many Glacier route (initial bus cost included)			$105,000-110,000	
Initial cost of support facilities	$326,000	No support facilities	$2,000,000-2,200,000	
Annual cost for support facilities	$36,200	No support facilities	$230,000-250,000 (includes St. Mary to Many Glacier)	
Traffic Management	Inform visitors of congestion problems	Inform visitors of congestion problems	Inform visitors of congestion problems	Continue existing management restrictions on vehicle size and length
	Encourage south and east loop trip	Encourage south and east loop trip	Encourage south and east loop trip	
	Promote travel to park by public transportation system	Promote travel to park by public transportation system	Promote travel to park by public transportation system	
	Limit vehicles over Logan Pass	Limit vehicles over Logan Pass	Limit vehicles over Logan Pass	
	Impose 20-foot length restriction during peak times on high-use days	No vehicle length restrictions	Impose 20-foot length restriction during peak times on high-use days	

Table 20: Roadway Width (feet) by Section and Alternative

Alternative	Section 3	Section 4	Section 5	Section 6	Section 7	Section 8	Rock Removed In 4 and 5
No-Action	22-28*	22	18-21	22-23	21-22	21-22	0
A	20-28	20	18-21	22-23	22	22	10 cu yds
B	24-28	24	18-21	22-23	24	24	985 cu yds
C	24-28	24	18-21	22-23	24	24	985 cu yds

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*The 28-foot road width is only in 2 miles of the road rebuilt in 1965.

PHASING SCHEDULE

Implementation of any of the alternatives would be accomplished in three phases. Specific time frames have not been set because the rate of implementation is contingent on congressional appropriations and park visitation levels.

Phase 1

Going-to-the-Sun Road Modifications. Some road construction projects have already been programmed and are underway or completed: reconstruction of section 2 (previously described), stabilization of the masonry wall at the Loop, repair of Rose Creek Bridge abutments, and emergency repair of road failure near Triple Arches.

A phasing schedule has been developed for road construction to correct the most immediate needs and to resolve problems in the most congested and constricted sections first. The reasons for correcting the most immediate needs first is obvious, but the second premise is a little more involved. The major points of constriction on Going-to-the-Sun Road are the narrowest sections, 4 and 5. Some capacity could be gained by minor widening of those sections. In addition, working on the middle sections first would allow contractors to avoid hauling construction materials and equipment over freshly rebuilt roads, thereby preventing damage to the new road. Based on those premises, the following priority list has been developed:

Repair failing roadway embankment segments in section 4

Remove protruding rock faces, repair/replace parapets and rails, correct drainage, and resurface sections 4 and 5

Rehabilitate and resurface the remainder of section 4

Public Transportation. GPI's bus schedule would be increased to a minimum of every four hours for Going-to-the-Sun Road and/or allow private companies to operate commercial vehicles in the park under state and ICC standards and NPS concession permit or contract.

Traffic Management. The public would be advised of congestion problems on Going-to-the-Sun Road and the optional times for traversing Logan Pass.

Park visitors would be encouraged to make a loop trip through and around the eastern and southern portions of the park on Going-to-the-Sun Road, US 89, State Route 49, and US 2. Travel to the park by a regional public transportation system would be promoted.

Phase 2

Going-to-the-Sun Road Modifications. Failing road embankments would be repaired and parapets and walls in section 6 would be installed. Contractors would be required to operate only in late summer when roads were dry to avoid damaging the road in section 8.

Sections 7 and 8 would be reconstructed and resurfaced. Again, contractors would be required to operate only in late summer when roads are dry to avoid damaging the road in section 8.

Public Transportation. Limited (two-hour headways) or full-scale shuttle bus service for Going-to-the-Sun Road would be implemented using GPI's expanded bus operation and/or contracted commercial vehicles operation.

Traffic Management. Under all alternatives, traffic management actions proposed in phase 1 would be continued. Under alternatives A and C, a 20-foot vehicle length restriction would be imposed on vehicles traveling over Logan Pass.

Phase 3

Going-to-the-Sun Road Modifications. The last road modification to be made would be reconstructing and resurfacing section 3.

Public Transportation. If successful, GPI's Going-to-the-Sun Road shuttle bus system would be further expanded from St. Mary village to Many Glacier. If not, GPI's expanded bus operation and/or a contracted commercial vehicle operation would be continued.

Traffic Management. Steps would be taken to limit the number of vehicles traveling over Logan Pass.

MITIGATING MEASURES TO BE IMPLEMENTED DURING CONSTRUCTION

Under all alternatives where road construction or rehabilitation was involved, borrow, aggregate base, and asphalt paving materials necessary for road construction or rehabilitation would come from sources outside the park. The exception would be potential use of the historic quarry. Some existing borrow pits and maintenance areas within the park would be used as staging areas and would be rehabilitated after road construction. Construction staging areas would probably be at Logan Creek and Sun Point, material might be stockpiled at Moose Country pit, and there might be limited use of Logan Pass as well. Lake McDonald and St. Mary Lake would be the only water sources used. Screens would cover openings of hoses to be used to withdraw water from the lakes for use in soil compaction and hydroseeding.

The contractor would be required to remove all merchantable timber. Small trees and slash would be burned at the Moose Country pit (or other designated area) only, and all applicable state controls would be followed. All waste material would be deposited outside the park, or appropriate waste material such as rock and soil could be used as fill in the rehabilitation of old quarry sites such as the one at Moose Country. Restrictions would be set on the length of time allowed for construction delays based on the time of day. There would be no work after dark near developed areas and campgrounds.

A park staff member would be on-site during construction to monitor all ground-disturbing activities, such as stockpiling of plants and topsoil, slope stabilization, and culvert installation, to ensure that activities meet park standards and prevent unnecessary impacts. Construction activities would be confined to the smallest area possible to eliminate unnecessary impacts, including selective tree removal within the clearing limits. Construction areas would be clearly delineated, and the contractor would work within the limits.

In cases where construction occurred in stream and river corridors, such as replacing culverts, procedures would be taken to limit the amount of slumping and/or erosion of material into the waterway. Flowing side streams would be temporarily routed past the construction area through bypass culverts and returned to their channel downstream. Park staff would designate when this activity would be carried out, depending on stream flows, fish spawning activities, and weather predictions. Any turbid water resulting from construction activities would be collected and pumped to a location where sediment can settle. Culverts that might be used by fish would be designed to allow fish passage.

Soils would be protected from erosion by use of revegetation of native species, contour ditches, and matting. Silt fences would be used along gentle fill slopes to retain soils while allowing water to percolate through.

A vegetation plan such as the one being developed for the Lake McDonald road section would be prepared by the park design team for the remainder of the roadway. The plan would identify and prescribe revegetation treatment for each identified land type. Extensive revegetation efforts would be undertaken in all disturbed areas, including cuts, fills, and turnouts. Areas of high-erosion potential would be given the highest priority. Additional topsoil might be brought in from outside the park as needed. Crucial areas of slope cuts, downslope fills, and other associated soil-disturbing activities would receive topsoil that would be spread over the surface in preparation for revegetation. Initially these areas would be hydroseeded using annual grasses to stabilize soils, minimize erosion, and reduce establishment of exotic species. The park would restore native vegetation wherever possible. Where that is not possible, the goal would be to restore a natural-appearing vegetative community. Only plant materials indigenous to the park that are produced under agreement with the Soil Conservation Service Plant Materials Center or other applicable contractors would be used. Construction vehicles would be hosed before entering the park to limit the potential for spread of exotic plant species.

Numerous historic culvert headwalls along most sections of Going-to-the-Sun Road would need to be replaced. The stone headwalls that are visible from the road, other visitor use areas, or those that are determined to be architecturally significant would be documented, dismantled, and later reassembled over the new culvert pipes. The other headwalls would be documented, dismantled, and the stone would be salvaged for reuse in other stone structures in the park. Historic log guardrails or stone parapets would be constructed where retaining walls were placed on fill slopes. These measures would help retain the historic character along the road.

An NPS archeologist will be available during construction to evaluate any archeological material that may be discovered during the construction process. Work would be done in conformance with the CRP, as amended.

ALTERNATIVES CONSIDERED BUT REJECTED

A mandatory shuttle bus system was considered for peak-use periods on Going-to-the-Sun Road. However, massive subsidies would be necessary to operate the system. One of the passenger-loading forecasts included accommodating approximately 20 percent of all existing traffic on Going-to-the-Sun Road. System costs were estimated at $1.7 to 2.3 million, depending on bus size. Congestion on the road would decrease, but large parking lots would be needed at the staging areas, as well as larger parking areas at each bus stop. This alternative was rejected because of the large costs and unacceptable environmental impacts, perceived visitor dissatisfaction, and operational problems inherent in enforcing a mandatory system.

Wider paved surfaces were also considered, including widening sections 3, 4, 7, and 8 to 28 feet and widening all sections (3, 4, 7, and 8), except the pass portion (sections 5 and 6) to a paved width of 30 to 32 feet. This latter alternative would provide 11- or 12-foot driving lanes with 4-foot shoulders that could be delineated as directional bicycle lanes. These alternatives were analyzed and rejected as infeasible for Going-to-the-Sun Road during selection of the preferred alternative for section 2 in 1985. The proposal for section 2, from the junction of the east Apgar campground road to the junction with the Lake McDonald ranger station road at the northeast end of Lake McDonald, would be a 23-foot-wide paved surface with no shoulders. This alternative was selected because it solved many of the roadway problems but was anticipated to cause the least environmental damage. Further investigations of bicycle traffic showed that the numbers of riders were not high enough (average of 8.5 bicycles/day in July 1984) to warrant the increased cost and environmental damage. (See the "Planning Approach and Scope" section for more information on bicycle use.) In addition, although a greater roadway width would improve the experience for those visitors with wider vehicles or those who wished to travel faster, the benefits of the wider road were judged insufficient to offset environmental and visitor experience considerations.

Because it is not considered good highway design to have a road of widely varying widths (for example, 24 feet for section 2, 28 feet for sections 3 and 4, and 20 feet for sections 5 and 6), no alternatives wider than 24 feet were considered for the western approach to Logan Pass (sections 3 and 4).

Another alternative considered but rejected involved section 5, from the west portal of West Side Tunnel to the summit of Logan Pass. One of the problems was that the existing stone parapets do not have the elevation desired to provide adequate guardrail protection due to successive road resurfacings and subgrade buildup. An alternative to raising the parapets would be to lower the road surface by tearing up the older layers and improving the road surface. This would require removal of surfacing and excavation of the subgrade to a depth of approximately 3 feet below existing roadway grade. Risks involved in this operation would be substantial, including damage to and destruction of historic walls, parapets, and structures because of equipment operations and blasting. Other risks involved disruption of the drainage system and loss of those historically significant masonry structures that could be lowered. Those sections of parapet walls and guardrails that are constructed on cantilevered bases extending under the roadway would be disturbed or destroyed. Because the rock slopes are not vertical on the inboard side of the road, lowering the road would require that the road edge be moved outward, and therefore lessen the effective roadway width by 2 to 4 feet. Because of the substantial risks involved as well as the reduction of roadway width, this alternative was rejected.

OTHER ROAD ALTERNATIVES

Packers Roost Road

The first alternative for Packers Roost Road would be to widen the 10-foot, one-way road to 14 feet. The road would be resurfaced with crushed gravel, passing turnouts would be added, and the Alder Creek Bridge would be replaced with a culvert. The second alternative would be to develop a new trailhead at the Granite Park Chalet at Packers Roost instead of the Loop. A 600-foot section of Going-to-the-Sun Road would be realigned and a new grade intersection constructed about 250 feet north of the present Packers Roost Road approach. A new two-lane, 20-foot-wide, paved road would be constructed by clearing, grading, draining, and surfacing from the new approach to the present road and a one-way turnaround loop provided at the road end. The road grade would be reduced from the existing 10 percent to 8 percent. Parallel parking would be provided along the Loop road for 25 cars or small buses.

Camas Road

Work proposed for this section of road would involve the application of a bituminous plant-mix overlay, with application of bituminous seal coats about every five years.

Sun Point Road Intersection

The intersection would be improved by converting the present Y connection to a standard T intersection, with painted left-turn channelization on Going-to-the-Sun Road. Three minor, unstable areas on the access road would be removed, and the contaminated surfacing would be replaced. The access road and paved parking areas would be improved by applying a bituminous plant-mix overlay, and the parking area would be modified as described in the approved *Sun Point Development Concept Plan* (NPS 1985a).

Turnouts

Many of the existing turnouts on Going-to-the-Sun Road need to be expanded or rehabilitated. Of the over 130 turnouts, more than 100 would be retained with some improvements, 19 would be removed, and 10 would be enlarged. Table 21 presents the alternatives for these turnouts.

The Section Detail, 3-5, Road Turnout Plan and Section Detail 6-8, Road Turnout Plan maps show the location and disposition of turnouts to be retained, expanded, or removed.

Quarry Operation

The park has had trouble finding good quality stone to repair the historic stonework along Going-to-the-Sun Road. Stone that is available fractures during natural weathering processes. Other available stone imported from outside the park is inferior and does not match the historic stonework well. A historic quarry above the road camp is directly across Going-to-the-Sun Road from the Birdwoman Falls turnout. There is some question as to whether this stone is usable because it is believed by FHWA to be overshot (undergone too much blasting) and severely fractured. A FHWA geotechnical engineer has been asked to evaluate this quarry as a possible source of replacement/repair stone. If the stone is acceptable and a decision is made to use it, the quarry would provide the opportunity to interpret an ongoing quarry operation. The amount of stone that would be quarried is unknown because future stone repair cannot be predicted. However, the amount will be defined in the CRP, as amended. If the historic site is not suitable, research will be done to identify suitable sources. Impacts of quarrying at other locations will be evaluated when they are found.

Table 21: Turnout Alternatives
Going-to-the-Sun Road

Milepost	Description	Disposition/Alternatives
12.10	Lake McDonald Ranger Station Road	
12.32L*	McDonald Falls turnout**	1) retain existing turnouts 2) obliterate pullouts and construct trail from McDonald Creek trailhead parking to view waterfall, move road over towards rock wall 3) same as above but build pedestrian walkway with metal barrier to stop parking and require less road shift 4) extend rock railing – rock needs to be higher on ends to discourage pedestrian access
12.77L	Sacred Dancing Cascade turnout	1) retain existing parking area 2) relocate Johns Lake trailhead
13.00R	Turnout, gravel (Mt. Brown)	enlarge
13.43R	Moose Country turnout	1) retain existing 2) add interpretive structure 3) add parking on creek side of road 4) enlarge parking lot
13.09R	Small turnout w/view of falls	retain
14.19	McDonald Creek overlook	1) retain existing – construction of viewing platforms is commitment to retention 2) realign or remove vegetation to improve sight distance 3) modify approach to pull walkway away from trees to prevent vandalism
14.35L	Small turnout w/rock wall	retain
15.28L	Camp 8 pit turnout	retain
16.08L	Avalanche Creek turnout, restrooms	relocate off of road
16.15R	Small turnout before bridge	remove
16.19L,R	Turnouts after bridge	remove
16.22R	Small turnout, gravel	remove
16.34L	Sperry Glacier View turnout	remove
16.84L	Small turnout on curve	remove
17.07L	Turnout	retain and improve
17.27L	Red Rocks Point turnout	retain

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*L = Left, R = Right

**Turnouts are paved unless otherwise marked

Milepost	Description	Disposition/Alternatives
17.63L	Turnout	retain
17.76L	Turnout	retain
17.90L	Turnout	retain
18.33R	Avalanche View turnout w/sign	widen turnout
18.69L	Turnout	retain
18.88L	Turnout on curve	retain
19.24L	Turnout	retain
19.70R	Turnout	remove
20.22R	Turnouts for comfort stations	enlarge
20.43L	Gravel turnout	remove
20.62	Logan Creek Bridge	1) remove parking areas 2) add parking area on north side of creek near historic cabin
21.73L	Turnout on curve	retain
22.11L	Tiny turnout	remove
22.16	Packers Roost Road	
22.20L	Turnout	retain
22.27L	Turnout	retain
22.29R	Alder Creek turnout, gravel/paved	retain as slow vehicle turnout, needs rail
22.33L	Granite Creek turnout	retain
22.75L	Turnout	1) remove turnout 2) widen turnout 3) add guardrail
22.88L	Turnout w/rock wall	retain
23.02L	Turnout, gravel/paved	1) remove turnout 2) widen turnout 3) add guardrail
23.05L	Fossil Algae Deposit turnout w/stones	1) remove turnout 2) widen turnout, add retaining wall and guardrail 3) add guardrail
23.13L	Turnout, gravel/paved w/stones	remove

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*L = Left, R = Right
**Turnouts are paved unless otherwise marked

Milepost	Description	Disposition/Alternatives
23.26L	Widened shoulders	remove
23.34-.39	West Side Tunnel	1) remove turnout 2) widen turnout with structure 3) add guardrail
23.42L	Turnout w/wall	retain
23.60R	Rockfall area	retain
23.82R	Turnout	remove, emergency parking only
23.92	Lower loop	1) barricade present pedestrian road crossing, stripe walkway along road to lower loop, provide crossing where sight distance better 2) close Loop trailhead, develop trailhead at Packers Roost (or some point along road) 3) provide trail and pedestrian crossing uphill and downhill from hairpin 4) rock cut above to widen road and provide walkway
23.99	Upper loop	
24.04L	Turnout before gate	retain -
24.11R	Turnout	retain
24.44R	Small turnout w/ wall	close to public use
24.58R	Crystal Point turnout	retain for emergency parking and maintenance use
24.78R	Series of three turnouts	remove all but lower turnout
25.08R	Turnout	retain
25.16R	Turnout, gravel/paved	retain
25.50R	Swede Point turnout w/wall	retain
25.70R	Granite Creek turnout w/wall	retain
25.85L	Little Granite Creek turnout w/wall	remove
25.99R	Alden Trail turnout, gravel/paved	retain and improve
26.30R	Turnout, exhibit ahead sign	retain
26.37R	Turnout w/interpretive fire exhibit	add guardrail
26.57R	Turnout w/work area sign	retain
26.67L	Road Camp turnout	relocate maintenance structure to area on outside of curve
26.67R	Turnout, radiator water	retain
26.79R	Birdwoman Falls turnout	1) pullout needs striping, may need more width 2) remove sign for Birdwoman Falls and use another larger turnout instead

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*L = Left, R = Right
**Turnouts are paved unless otherwise marked

Milepost	Description	Disposition/Alternatives
26.93R	Turnout w/stones	could be enlarged by moving road over and constructing separated median (use minimal vegetation avalanche chute)
27.02	Haystack Creek culvert	extend rock wall to block access to culvert, remove shoulders
27.51R	Glaciation interp turnout w/wall	has exhibit, needs striping
27.69R	Grouse Point turnout	retain, slow vehicle turnout
28.63-.79	Weeping Wall	
28.94R	Alpine Sanctuary turnout	retain
29.60L	Riprap Point turnout	retain, not for public use
29.80	Shoulder widening w/wall	remove, too small
29.82L	Shoulder widening	retain, not for public use
29.84R	Shoulder widening	retain, not for public use
30.2L	Shoulder widening	retain, not for pubic use
30.4L	Shoulder widening	retain, not for public use
30.6L	Shoulder widening	retain, not for public use
30.84R	Shoulder widening w/stones	retain
30.89R	Shoulder widening w/stones, gravel/paved	retain
31.04R	Turnout w/wall	remove
31.09L	Turnout, rockfall area	retain
31.12L	Turnout, gravel	retain
31.17R	Rimrock turnout, gravel/paved	retain
31.17L	Rimrock turnout	retain
31.25L,R	Oberlin Falls/Garden Wall/Lewis Range turnouts	1) retain existing turnouts 2) obliterate parking on inside of curve with barrier rock 3) consolidate parking and provide for pedestrian use, possibly w/viewing structure
31.32L,R	Widening on curve, gravel	remove
31.38R	Shoulder widening	retain, not for public use
31.42R	Widening on curve, gravel	retain, not for public use
31.47L	Turnout, gravel	retain, not for public use
31.66R	Shoulder widening	retain, not for public use
31.68L	Shoulder widening	retain, not for public use
31.71	West entrance Logan Pass	
31.77R	Shoulder widened between entrances	remove in combination with repave (remove wheel wells) and restripe parking lot to add about 50 spaces and concessioner bus parking

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*L = Left, R = Right

**Turnouts are paved unless otherwise marked

Milepost	Description	Disposition/Alternatives
31.82	East entrance Logan Pass	
32.00R	Widened shoulder w/wall	retain
32.10R	Big Drift turnout	1) retain existing 2) realign road or remove rock to reduce curve and reduce snowdrifting if possible
32.30R	Widened shoulder w/wall	retain, not for public use
32.40R	Turnout w/wall	retain
32.44R	Lunch Creek turnout	retain
32.71R	Upper tunnel turnout w/wall	retain
32.86-.94	East Side Tunnel	
33.03R	Turnout w/wall	retain
33.10R	Turnout w/wall	retain
33.21R	Turnout w/wall	retain
33.35R	Turnout w/stones	retain
33.56R	Turnout w/stones	retain
33.82R	Turnout w/stones	retain, needs rail
34.25R	Turnout	retain
34.36R	Turnout	retain, pave and enlarge
34.47R	Turnout	retain
34.56R	Turnout	retain and pave
L,R	Shoulder widening	retain
34.59R	Siyeh Bend turnout	retain
34.78R	Turnout, gravel	retain, fill gutter
34.97R	Turnout	retain
35.06R	Turnout	retain
35.49R	Widened shoulder	remove
35.73R	Turnout	retain as slow vehicle pullover
36.07R	Turnout	retain
	Turnout	retain, enlarge pavement
36.39R	Jackson Glacier Overlook	retain
36.48R	Gunsight Pass trailhead	retain
37.06R	Shoulder widening, gravel	retain
37.19R	Turnout w/avalanche sign	retain
37.75R	Slow vehicle pullover	retain
37.91R	Turnout	expand, possible St. Mary Falls trailhead
38.27R	Turnout	retain, possible St. Mary Falls trailhead

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*L = Left, R = Right

**Turnouts are paved unless otherwise marked

Milepost	Description	Disposition/Alternatives
38.54R	St. Mary Falls trailhead	retain as turnout, possible wayside exhibit
38.73R	Turnout, horse loading area	retain
38.98R	Turnout	retain
39.17L	Turnout	retain
39.19R	Turnout	parking needs to be formalized, perhaps w/striping, or expanded
39.23	Sunrift Gorge Bridge	
39.26L	Turnout (extra shoulder)	1) delete parking on hillside of road and develop foot trail and bridge to existing underpass as access to Sunrift Gorge 2) develop new long-term trailhead parking for the Siyeh Pass trail away from this area, possibly to Sun Point
39.33R	Turnout, gravel	retain and expand
39.65L	Shoulder widening	retain as slow vehicle turnout
39.82	Sun Point	
40.24R	Lost Lake turnout	retain
40.55R	Slow vehicle pullover	retain as slow vehicle pullover
40.87R	Widened curve	remove
41.24R	Turnout on curve w/wall	retain and expand
41.28L	Turnout	remove
41.85R	Turnout	retain
41.85R	Turnout	retain
42.03R	Turnout	retain
42.60L	Wild Goose Island turnout	1) delete one roadside parking area 2) develop overlook structure near road 3) consolidate parking on uphill side of road, reduce number of pedestrian crossings 4) develop new road, landing, and off-road parking area (slopes could be too steep) 5) realign road to outside shoulder and expand parking on inside shoulder (needs large fill) 6) add trail to east side of road
42.74L	Wild Goose Island turnout	
42.78	Wild Goose Island turnout	
43.04R	Turnout on curve	retain
43.56	Rising Sun campground road	
43.59	Rose Creek Bridge	
44.38R	Turnout	retain
44.59R	Turnout, gravel	remove
R	Turnout	retain

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*L = Left, R = Right

**Turnouts are paved unless otherwise marked

Milepost	Description	Disposition/Alternatives
45.25R	Turnout	remove
45.42R	Triple Divide Creek turnout	needs expansion by fill
46.32R	Turnout	retain
47.26L	Two Dogs Flats turnout	add two interpretive turnouts in this area for wildlife viewing
47.89R	Turnout	retain
48.23R	Turnout, gravel	retain not for public use
48.45-.46	Widened shoulder, gravel	remove
48.70R	Turnout	retain
48.96R	Turnout	retain
49.00	St. Mary River Bridge	
49.26	Entrance station	
49.67	Divide Creek Bridge	

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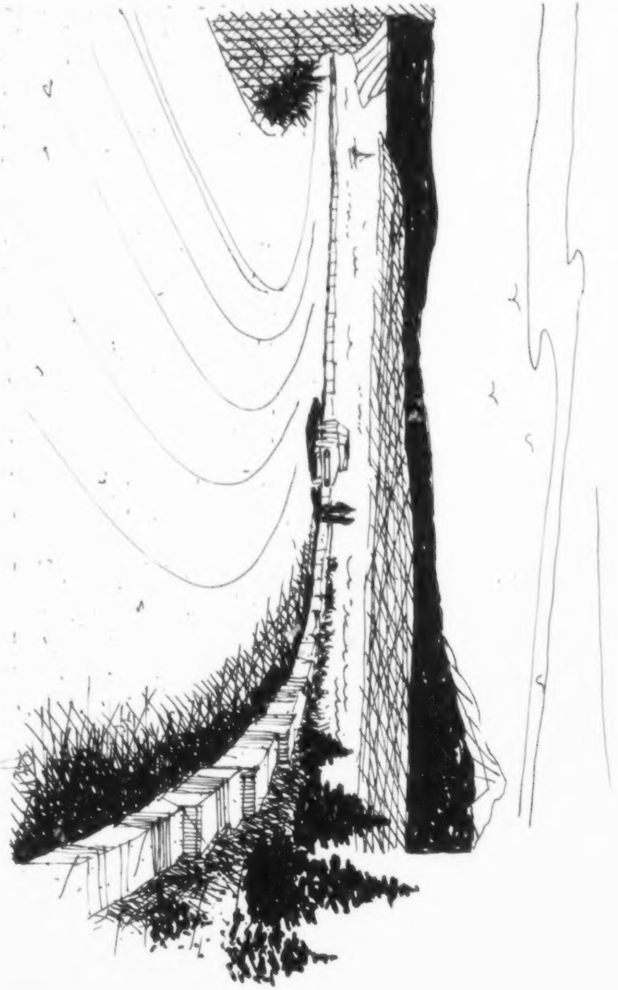
*L = Left, R = Right
**Turnouts are paved unless otherwise marked



ENVIRONMENTAL CONSEQUENCES

IMPACTS OF NO-ACTION ALTERNATIVE

Socioeconomic Environment/Visitor Use

Visitor use and traffic patterns would most likely continue according to current trends. Travelers using Going-to-the-Sun Road would continue to be inconvenienced by rough pavement caused by repeated patching of numerous potholes, advanced pavement cracking, and large-scale rough breaks from road-base and pavement failures. The ultimate failure of the road would make the road impassable for visitors. Damage to motor vehicles and slow traffic caused by the rough pavement would continue. If current trends continued, the pavement surface would continue to deteriorate, possibly leading to traffic restrictions or road closures.

Growth in traffic could result in additional hours of speed reduction, traffic stacking, and generally unpleasant driving conditions. The narrow traffic lanes would continue to make driving wide vehicles difficult, requiring greater-than-normal driver concentration. If a vehicle left the pavement edge, the lack of shoulders would make recovery of control difficult, creating a hazardous condition. Maintenance activities such as patching would interfere with traffic, increasing congestion and visitor frustration.

Safety problems would continue because of narrow lanes, short sight distances, and erratic use of turnouts in dangerous areas. Accidents would be expected to increase as traffic increased. Traffic flow would probably continue to slow because of increased traffic density. Vehicles would continue braking unexpectedly, when trying to drive into turnouts and when pulling out into traffic.

Bicyclists would continue to be threatened by motorists hitting them with their vehicles or side-view mirrors, or being forced off the road while driving in the traffic lane. Bicycle use would continue to be prohibited during peak-use hours.

The lack of a visitor transportation system would preclude some visitors from traveling over Going-to-the-Sun Road. These visitors would include people with oversize vehicles and those who arrive at the park by other than private vehicle, employees of the park or concessioner without vehicles, and people too afraid to drive over the pass themselves. Inconvenience to hikers entering on one trailhead and exiting another would continue.

Cultural Environment

No impacts on known archeological sites would occur.

Current management and maintenance practices for historic features would continue. None of the qualities for which Going-to-the-Sun Road was listed on the National Register of Historic Places would be affected.

Natural Environment

The continuation of existing roadway management and maintenance would result in few if any negative impacts on natural resources. No significant new disturbance of soil, vegetation, or wildlife would result. Vegetation thinning for vista maintenance would continue in accordance with Glacier National Park's "Vista Clearing Plan."

Exotic vegetation, including noxious plants, would continue growing along the disturbed roadsides. The spread of exotics into undisturbed areas on the west side is unlikely due to the heavy forest cover and competition from the established native plants. However, exotics are invading undisturbed areas on the east side, primarily susceptible meadows away from the roadside.

Some road kills of deer, small mammals, and bears would continue. Roadside feeding of bears would continue despite strict enforcement against this practice.

There would be no impacts on threatened or endangered species, except the effects of roadside feeding. No known automobile-related grizzly bear fatalities have occurred in the park.

There would be no impacts on water quality.

Although the road lies in the 100-year floodplain of most creeks along the roadway, section 5.B.2.c. of the NPS final procedures for implementing EO 11988 "Floodplain Management" and EO 11990 "Protection of Wetlands" (45 FR 35916 as revised by 47 FR 36718) excepts entrance, access, and internal roads from compliance with EO 11988. No wetlands would be disturbed.

Continued growth of the vegetation on the road slopes would produce more of a sense of enclosure along the road, affecting the view and general atmosphere. As previously stated, the park would continue to selectively remove trees and vegetation in accordance with the ongoing vista-clearing program.

Park Operations

Failure to reconstruct the roadway would result in accelerated deterioration, increased maintenance costs, and the probable ultimate failure of the roadway. The continued subgrade failure and surface deterioration would also substantially increase maintenance costs.

IMPACTS OF ALTERNATIVE A

Socioeconomic Environment/Visitor Use

Repaving and repairing the subgrade and surface would improve ride quality for visitors after completion of the project. Short-term inconveniences would include delays, noise, dust, and fumes typical of road construction projects. Blasting for the rock cuts would disturb visitors. Trucks hauling material from the borrow sites to the project would be an inconvenience to visitors due to increased congestion. These short-term effects should be more than offset in the long term by an improved road surface with fewer maintenance requirements.

The safety of the roadway would be enhanced because of improvements in the pavement, in sight distance, and in turnout areas.

The designated width under this alternative would not increase the traffic capacity of the road. As visitation and traffic increased, congestion would also increase. Narrow lanes would continue to make it difficult and dangerous for cyclists, motor homes, and tour buses to share the road. Bicycle use would continue to be prohibited during peak-use hours.

There would be an increase in bus traffic providing circle tours and connecting the east and west sides of the park and developed areas and trailheads. The operational characteristics of a GPI coach in mountainous terrain would be equivalent to about five automobiles in the traffic stream. The increase of bus service would not appreciably reduce the amount of private vehicular traffic.

GPI (or other provider) would incur increased costs for expanded shuttle service. The fleet of existing concessioner buses would probably not be adequate to provide for the increased service. As a result, they would have to purchase vehicles compatible with the physical characteristics of the roadway and visitor expectations of an experience similar to the existing concessioner buses. New dormitory space for drivers would be required and vehicle-parking demands would increase.

Implementation of a visitor transportation service with frequent service would benefit those visitors who are afraid to take their own vehicles over the pass and those with oversize vehicles. Visitors arriving at the park by means other than private vehicles could traverse Logan Pass, and employees and hikers could more easily travel from one developed area or trailhead to another. Implementation of the transportation service would also reduce the need for additional parking.

These impacts are not expected to affect park visitation or the operation of concession facilities, since delays and inconveniences would be minor. Road access would be provided for normal visitor traffic during the summer season. Businesses outside the park should not feel a significant effect.

Implementation of the traffic management actions would reduce traffic congestion on Going-to-the-Sun Road; however, limiting the numbers of vehicles traversing Logan Pass might deny some visitors use of the roadway. Drivers would experience delays while waiting for congestion to clear to the point that they could move through the checkpoints or would use an alternate route.

Limiting the number of vehicles driving over Logan Pass could also generate an increase in traffic on other segments of the park road system. Visitors who are not allowed over the pass might seek alternative recreational opportunities that could motivate them to explore different areas of the park. These increases should be marginal and have no significant impact on the infrastructure of the road system, nor on the scenic and recreational character of the system.

Implementation of a 20-foot vehicle-length restriction on the upper portions of Going-to-the-Sun Road would deny some visitors use of the road and might reduce the traffic volume by 8 to 10 percent during high-use periods. The decrease in congestion would be slightly offset by the increase in traffic of GPI coaches and private vans providing circle tours and connecting the east and west sides of the park and developed areas and trailheads. (See appendix A for tours and locations.)

Cultural Environment

There would be no impact on known archeological sites. The majority of the road reconstruction work would be within the previously disturbed right-of-way. There is some small possibility of disturbing cultural material where roadside turnouts would be enlarged or created. The construction contract would require emergency stops of work to allow archeological salvage if cultural material was found.

Although Going-to-the-Sun Road has been commemorated on the National Register of Historic Places for its engineering feat and its identification with the auto tourist, it represents more than those distinctions. In keeping with NPS landscaping policy, the road was designed to minimize intrusions on a natural area and to not detract from visitor appreciation of the park's beauty. In forested areas, trees were left near the road. This approach preserves as much of the natural environment as possible and gives the visitor a feeling for the forest. Design elements for the more rugged topography follow natural curves. Unintrusive stone masonry for retaining walls, guardrails, bridges, and drainage structures harmoniously blend with the natural surroundings. The constant 6 percent grade on the western ascent gives visitors an appreciation of the mountainous terrain that they pass through.

Although the plan divides Going-to-the-Sun Road into eight sections, the impacts can be viewed for its entirety. Basically, alternative A calls for retaining the road width while repairing subgrade failures, repaving areas of roadway stress, correcting drainage, stabilizing masonry walls, constructing some new stone parapets, reconstructing embankments in three areas, removing a minimal amount of protruding rock-face, and thinning roadside vegetation. These actions would have no cumulative impacts on the historic road. Road safety would improve without sacrificing any historical integrity. In fact, such actions as removing recent roadside vegetation and reconstructing embankments would return the road to its historical appearance. The National Register of Historic Places form for the road recognizes that periodic maintenance and drainage problem corrections would be necessary.

A new single-span bridge over Divide Creek might replace the existing bridge. The current bridge, while sound, is subject to unpredictable damage or failure from heavy spring runoff or flashfloods. To mitigate the detraction from the original concrete arch, stone-faced structure, the new bridge would have a similar stone face.

Natural Environment

Rehabilitation of the Going-to-the-Sun Road with turnout improvements would result in minimal impacts to bedrock, soils, vegetation, wildlife, water, and air quality because the majority of the road reconstruction work would be within the previously disturbed right-of-way.

Repairs to correct drainage problems and base failures would require localized excavation of the road-base material, which would disturb areas immediately adjacent to the road. The foreslope and shoulder would be disturbed in areas where wet subgrade had to be excavated and replaced and where drainage structures were installed. The backslope would be minimally impacted. Selective tree cutting would be done to improve sight distance on some curves and turnouts. Roadside ditches would be regraded to remove encroaching vegetation and improve drainage.

There would be an irretrievable loss of approximately 10 cubic yards of bedrock from rock-face removal along sections 4 and 5. Additional bedrock might be disturbed in localized areas where bedrock is exposed or shallow. In some areas deeper bedrock might be fractured from excavation or drilling. This amount of bedrock is undeterminable.

Road and turnout improvements would disturb approximately 60 acres of soils and vegetation. Most of this adjacent roadside area had been previously disturbed during original construction and also by ongoing maintenance activities. The majority of the disturbed areas would be revegetated.

The disturbance of soils and vegetation would increase the potential for short-term soil erosion. This would be a particular problem on sloped areas. Soil erosion would result in minor alteration of soil strata with a loss of some topsoil. There would be greater potential for temporary increases in siltation of rivers, lakes, creeks, and streams. Erosion abatement techniques as described in the "Description of Alternatives" section would be used to reduce impacts.

Soil compaction would occur where heavy construction equipment was used and in the area of the upgraded road. Compaction would result in dense, firm soils with reduced pore space that would limit air and water infiltration; this reduced porosity would increase surface runoff and accelerate local erosion. Reduced porosity would also limit the ability of soils to support vegetation. Paved roadways and turnouts would either wholly or partially eliminate direct inflow of water to soil, which would cause local changes in soil chemistry and alter adjacent vegetation types.

Revegetation efforts would be used to limit erosion and help prevent establishment of exotic plant species in disturbed areas. Only native grass, shrub, and tree species would be used. The exotic plant species already established in the area might compete with native species on the disturbed areas, even with hydroseeding and planting of native species, because the cleared slopes would be susceptible to invasion by these species.

Vegetation within the proposed construction areas is primarily native grasses, forbs, shrubs, and trees. Most vegetation in or directly adjacent to these construction areas would be destroyed. Upon completion of construction activities, disturbed areas would be revegetated. Recovery of the disturbed sites would vary depending on elevation, terrain, moisture, and other growth factors. Generally, it would take two to four years for grasses and forbs to recover, four to eight years for shrubs, and 10 to 20 years for trees. None of the proposed construction disturbances are in areas containing rare plant species or unique vegetative communities.

Disturbance to wildlife would generally be minimal. The noise and traffic of the traditional road use has already reduced the value of areas near the road as wildlife habitat. Construction activities would mainly result in short-term impacts such as displacement and destruction of resident invertebrates and vertebrates, including small mammals and birds. Larger mammals such as elk and deer would also be temporarily displaced in the meadow areas between Rising Sun and St. Mary. Elk and deer in these areas might be forced outside the park where they would be susceptible to hunters.

The temporarily disturbed cut-and-fill slopes would cause more forest openings, with production of high-quality succulent spring vegetation. Because this vegetation is attractive to such wildlife as black and grizzly bears, they might come close to the road in the spring, perhaps causing road kills and bear feedings. However, increasing visibility through sight-distance clearing and thinning of roadside vegetation would help offset this problem.

Blasting would be required because slopes would need to be cut in rock areas, including the pass, and stone would have to be quarried for wall repair or construction. Noise from blasting might result in the minor temporary displacement of wildlife in the immediate blast area. Blasting would involve the use of nitrate (salt)-based products. This unnatural salt source attracts ungulates, bringing them farther from their natural escape routes. They could be preyed upon more easily and, near roadways, would be more susceptible to injury or death from automobiles. To reduce this danger, these rock areas would be cleaned up thoroughly after blasting.

Grizzly bears might pass through the area because of their mobile nature, but their specific habitats such as food-production areas and denning sites would not be affected. Bald eagles are primarily in the lower McDonald Creek area, at least 1 mile from the Apgar end of the project, from late October to the end of November. Construction could be coordinated to avoid these times and locations.

Some minor localized and short-term siltation would occur in rivers, lakes, and streams because of construction activities, which could negatively impact aquatic species, especially fish-spawning habitat. Techniques such as settlement reservoirs, silt fences, and revegetation would be used to help mitigate potential impacts.

Floodplains or wetlands would not be affected.

Effects on air quality would include a temporary local increase of dust, fumes, and smoke from construction activity along the project. Hydrocarbon emissions would occur at the hot-mix plants at the staging areas, and dust would be produced from crusher operations at the borrow sites. Dust, fumes, and noise from trucks hauling material from the borrow-source would affect visitors. Slash burning would be reduced by chipping small tree material for use as mulch in revegetation. Slash would be burned only at approved sites, resulting in smoke and locally reduced visibility. Any burning would be conducted in accordance with state air-quality regulations. Dust, fumes, smoke, and noise would have a temporary effect on the visitor's experience while traveling through the construction areas. Traffic and motor vehicle emissions would be expected to return to long-term trends after construction was completed.

Selective tree and brush clearing for vistas, safety, and ditch cleaning and regrading would somewhat open the roadsides for visibility. The characteristic atmosphere of a narrow road winding through dense forests and alpine tundra would not change greatly.

Park Operations

Rehabilitation and resurfacing of the road would lower maintenance costs for Going-to-the-Sun Road. Improved drainage would reduce problems of wet subgrade, which would improve the life of the road.

If GPI decided not to provide the expanded visitor transportation services, the authority for another company would have to be obtained to provide this service. The Park Service would require additional administrative time to provide the oversight necessary to ensure that park policies are continued, particularly if the transportation services are provided by someone other than GPI.

The transportation system would create a need for 12 additional bus drivers, two dispatchers, and additional housing. Depending on the placement of the new dormitory, there would be a potential for conflicts between employees and local permanent residents. Employees would use the bus system to go to work, which would slightly reduce the income of the bus system and displace some visitors. In addition, a new maintenance facility would be necessary for the six additional 15-passenger vans.

Cost of the bus system and support facilities can be found in the "Description of the Alternatives" section. More detailed information on costs may be found in the "Road and Traffic Analysis" section.

IMPACTS OF ALTERNATIVE B

Socioeconomic Environment/Visitor Use

Long-term benefits to visitors would include a smoother ride on new pavement, improved traffic safety because of better sight distance near turnouts, reduced hazards from concealed roadside wildlife (until vegetation grows back to the road edge in two to five years), and improved driving convenience and safety provided by a wider road. Blasting of protruding rock faces would disturb visitors in areas that are away from the project.

Removal of rock faces 1 foot from the edge of the traveling surface and the 1-foot paved shoulder on each side of the road would increase the capacity of the road by about 3 to 4 percent in sections where these improvements were made. Consequently, roadway congestion would be decreased slightly from these actions. These actions would potentially lead to the reduction of accidents, particularly in section 5.

The 1-foot-wide paved shoulder would aid bicyclists but would not keep them out of the main traffic lane. The process of paving would raise the grade of the road surface. Without widening the shoulder, this might cause steepening of the shoulder or creation of an abrupt asphalt edge. Either case makes turning out of the traffic lane difficult for bicycles and other vehicles.

There would be an increase in bus traffic providing circle tours and connecting the east and west sides of the park and developed areas and trailheads. The operational characteristics of a GPI coach in mountainous terrain would be equivalent to about five automobiles in the traffic stream. The increase of bus service would not appreciably reduce the amount of private vehicular traffic.

GPI (or other provider) would incur increased costs for expanded shuttle service. The fleet of existing concessioner buses would probably not be adequate to provide for the increased service. As a result, they would have to purchase vehicles compatible with the physical characteristics of the roadway and visitor expectations of an experience similar to the existing concessioner buses.

Expansion of the visitor transportation system with frequent service would benefit those visitors who are afraid to take their own vehicles over the pass, as well as those visitors with oversize vehicles. Visitors arriving at the park by means other than private vehicle could traverse Logan Pass, and employees and hikers could more easily travel from one developed area or trailhead to another. Expansion of the transportation service would also reduce the need for additional parking.

This alternative would accommodate about half the number of passengers and would require about half the parking needs as alternative A. Because dormitory space would not be provided, there would be no impacts from constructing new housing. Implementation of the traffic-management actions would be the same as described under alternative A, except there would be no impacts caused by vehicle-length restrictions.

Cultural Environment

Impacts to archeological resources would be similar to those discussed under alternative A. Archeological clearance would be necessary for disturbed cut slopes, expanded turnouts, and other previously undisturbed areas.

Minor impacts caused by the road widening in sections 3, 4, 7, and 8 to a 24-foot width and the removal of approximately 985 cubic yards of rock-face protrusions in section 4 and 5 would not create a cumulative impact on the road. The greater safety provided by these improvements would overcome the minor detraction from the historic appearance. At the same time, the minor alignment change proposed for section 4 would impact the road's historic alignment for which it was partly nominated to the national register.

The two-barrel Alder Creek culvert replacement proposed for section 4 would be mitigated by using material that looks the same as that of the old culvert so it would not detract from the natural surroundings. A similar situation would hold true for the replacement of the Divide Creek Bridge as explained under alternative A.

Natural Environment

Impacts to natural resources would be similar to those discussed under alternative A; however, road widening (primarily sections 3, 4, 7, and 8) would result in increased negative impacts to bedrock, soils, vegetation, wildlife, water, and air quality.

Under this alternative, 985 cubic yards of bedrock would be irretrievably lost from rock-face removal along sections 4 and 5.

Total surface disturbance from road and turnout improvements as described under alternative A would be approximately 180 acres under alternative B. Impacted areas adjacent to the reconstructed roadways and turnouts would be revegetated.

The new wider roadway might have several effects on the vehicle/accident rate, especially on the east side of the park. Accidents might initially be reduced by the improved visibility offered by the increased road width and cleared slopes, until vegetation regrowth encroaches on the roadside in 5 to 10 years. The improved road would encourage faster traffic at night, when most wildlife accidents occur, which might increase the vehicle/wildlife accident rate. The initial growth of grass and forbs on revegetated slopes would attract herbivores and bears, resulting in slowed traffic and increased hazards.

Effects on grizzly bears by construction activity would probably not exceed the existing displacement caused by normal traffic on park roads. This displacement is now considered only minor. Food sources would not be affected by construction in the long term, although there is potential for short-term disruption of food source use caused by displacement.

Some localized sedimentation to Rose and Divide creeks from road runoff might occur from construction and slope cuts until revegetation takes place.

Impacts on air quality would be the same as described for alternative A.

The general atmosphere of the current winding lakeshore road enclosed by dense forest along Lake McDonald would for the most part remain. Some selective vista cutting and clearing would occur, as well as regrading of the roadside ditch. This would open the roadway to some extent.

Park Operations

The impacts of this alternative are similar to those described for alternative A, except that the transportation system would create a need for six additional bus drivers rather than 12, one dispatcher rather than two, and no dormitories would be provided.

Cost of the bus system and support facilities can be found in the "Description of the Alternatives" section. More detailed information on costs may be found in the "Road and Traffic Analysis" section.

IMPACTS OF ALTERNATIVE C

Socioeconomic Environment/Visitor Use

Impacts of road construction and widening would be the same as described for alternative B.

Visitors would benefit from the increased visitor transportation service. Convenience would be greatly enhanced by 1-hour and ½-hour headways.

Because the same level of improvement to the roadway would be provided, traffic congestion would be similar to that described under alternative B. However, congestion might be slightly less than alternative A if the visitor transportation system in C hauls one of the higher passenger loads (40,000 or above).

Additional parking-space demand would occur at West Glacier, Apgar Village, Lake McDonald Lodge, Rising Sun, and St. Mary to accommodate vehicles of visitors riding on the visitor transportation system.

The impacts resulting from implementation of the traffic management actions would be the same as described for alternative A.

Cultural Environment

Impacts on cultural resources would be the same as described for alternative B.

Natural Environment

Impacts on natural resources would be the same as described for alternative B.

Park Operations

Impacts on park operations would be the same as described for alternative A, except that the Park Service would need to spend more administrative time providing the oversight necessary to ensure that the park policies continued to be met with a more decentralized transportation function. The transportation system would create a need for 36 additional bus drivers rather than 12, two dispatchers (same as A), and additional housing. In addition, a new maintenance facility would be necessary for the 18 additional 15-passenger vans.

Cost of the bus system and support facilities can be found in the "Description of the Alternatives" section. More detailed information on costs may be found in the "Road and Traffic Analysis" section.

IMPACTS OF OTHER ROAD MODIFICATIONS

Packers Roost Road

Improvement of the Packers Roost Road would make access to the area less difficult for its users, and reconstruction of the road intersection would improve safety.

No impact would occur on known archeological sites, however, an archeologist will be present during construction. Because the road has been determined to have little historical significance, no impact would occur on historical resources.

Impacts on natural resources would be similar to those discussed under alternative B. Approximately 4 acres (alternative 1 for Packers Roost Road) to 10 acres (alternative 2 for Packers Roost Road) would be disturbed.

Resurfacing of the road would lower maintenance costs.

Camas Road

Installation of the final overlay on the Camas Road would improve the surface, which would provide visitors a smoother ride, lower maintenance costs, and extend the life of the road.

No known archeological resources would be impacted by construction activities. No historic resources would be impacted from implementation of this alternative. The Camas Road was constructed in the 1960s and therefore has no historic significance.

Because the road is to receive only an overlay, only the surface of the existing right-of-way would be disturbed. No negative impacts to natural resources would result.

Sun Point Intersection

Realignment of the Sun Point and Going-to-the-Sun Road intersection would improve visitor safety.

There would be no impact to known archeological resources, however, an archeologist will be present during construction. The Sun Point Road, including the Y intersection, follows the original alignment dating to the 1930s. This road lacks historical significance because it has no exceptional engineering features. In addition, it has lost any association with park development after the removal of the chalet to which it connected. Subsequent widening and paving have further detracted from any possible connection with park development. As a result, there would be no impact by modifying the Y intersection to a T intersection at the road's juncture with Going-to-the-Sun Road.

Only minor impacts on natural resources would occur. Approximately 5 acres of disturbance similar to that described under alternative B would result. Areas adjacent to the new intersection alignment would be revegetated.

Reconstruction of the intersection would lower maintenance costs.

Turnout Plan

Elimination of turnouts on curves or hills with inadequate sight distance would reduce the hazards of vehicles pulling into traffic without warning. Expanded parking areas, improved interpretation, and hardened trails would reduce impacts on adjacent vegetation as well as benefit visitors. Provision of more slow-vehicle pullovers would lessen visitor frustration and reduce hazards created by impatient drivers attempting to pass slower vehicles.

There would be no impact on known archeological resources. There is a slight chance that construction activities could disturb unknown archeological materials. As a result, an archeologist will be present during construction to monitor earth disturbance. Improving, enlarging, removing, and adding turnouts could have a negative impact on the historic qualities of Going-to-the-Sun Road through loss of some original fabric and the association of features.

Impacts on the natural environment from turnout modifications would be similar to those described under alternative B. There would be only minor disturbances to areas adjacent to turnouts to be improved. Approximately 9.5 acres would be reclaimed from the 19 turnouts that would be removed. About 5 acres of new disturbance would result from enlarging 10 of the turnouts. Construction of the one new turnout would result in about 1 acre of new disturbance. All disturbed areas adjacent to turnouts would be revegetated.

Turnout modifications would allow the park to better manage visitor use activities while increasing protection of natural and cultural resources.

Quarry Operation

Use of the historic quarry would result in an irretrievable loss of an undeterminable amount of bedrock. However, the amount of loss would not be large enough to significantly affect the total quantity of bedrock strata in the area.

Impacts to other natural resources would be insignificant and minor, including additional soil erosion and loss of vegetation.

Use of the historic quarry as an ongoing source for repair of historic stonework would result in a minor intrusion on visitors from the occasional noise of quarrying operations. This negative impact would be significantly offset by the benefit of having a quality source of rock for repair of existing historic rockwork and the added benefit of an additional interpretive opportunity that does not exist now.

If the rock at the quarry site is determined suitable by the Federal Highways Administration engineers, rock would be removed on an occasional basis and stockpiled for use in the repair of bridges, culvert headwalls, and retaining walls. Quarrying might require temporary road closures or delays most likely at night or during the off-season. Rock fracturing might require occasional use of explosives.

Noise from the blasting might result in the minor, temporary displacement of wildlife in the immediate blast area. The unnatural salt source from the nitrate (salt)-based products used in the blasting could attract ungulates, bringing them farther from their natural escape routes. They could be preyed upon more easily and, near roadways, would be more susceptible to injury or death from automobiles. To reduce this danger, these rock areas would be cleaned up thoroughly after blasting and fencing or netting of the quarry could help alleviate the problem.

A modern quarrying operation at the historic quarry would result in a minor degradation of the quarry's historic qualities. However, this would be significantly offset by the use of the high quality stone for repair of the existing historic stonework along Going-to-the-Sun Road. If it is decided that use of the quarry would be feasible, an Assessment of Effect (XXX) form would be prepared and submitted by the park.

SUMMARY OF ENVIRONMENTAL CONSEQUENCES

	No Action	Alternative A	Alternative B	Alternative C
Socioeconomic/ Visitor Use	No new impacts	Quality and safety of ride would be improved; fewer maintenance requirements; short-term delays, noise, and dust; visitor transportation system and traffic restrictions would slightly reduce congestion; traffic restrictions would prevent some visitors from experiencing Going-to-the-Sun Road.	Same as alternative A, except that a wider paved roadway with 1-foot shoulder would aid drivers and bicyclists and lack of length restrictions may prevent decrease in congestion.	Same as alternative B, except that expanded visitor transportation system might reduce congestion over that described in A.
Cultural Environment	No new impacts	Potential for disturbance of unknown archeological resources; loss of minor historic roadway qualities and character.	Same as A, except wider road would result in increased potential for disturbing unknown archeological resources; minor impacts would occur on historic alignment of Going-to-the-Sun Road.	Same as B
Natural Environment				
Land disturbance	No new impacts	60 acres* new disturbance	180 acres new disturbance	Same as B
Bedrock	No new impacts	Irretrievable long-term loss of about 10 cubic yards	Irretrievable loss of about 985 cubic yards	Same as B
Soils and vegetation	No new impacts	Short-term increases in soil erosion; loss of some vegetation	Same as A	Same as A
Wildlife	No new impacts	Minor disturbance from construction activities that include blasting	Same as A	Same as A
Threatened and endangered species	No new impacts	No effect	Same as A	Same as A
Water resources	No new impacts	Minor localized short-term siltation of waterways	Same as A	Same as A
Floodplains and wetlands	No new impacts	No effect	Same as A	Same as A
Air quality	No new impacts	Temporary increases in construction-related dust and vehicular pollution	Same as A	Same as A

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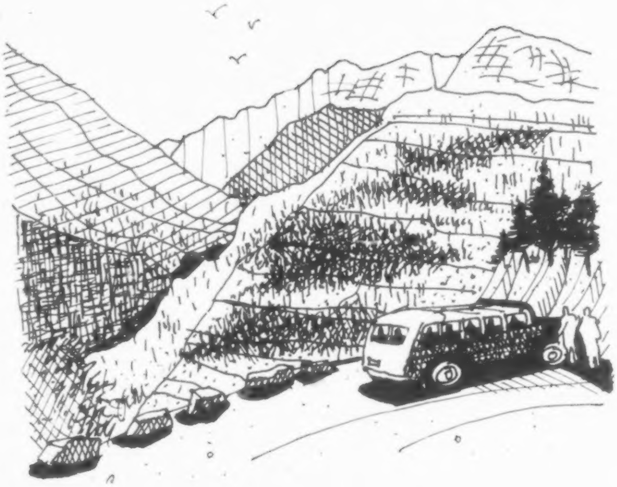
*These estimates are rough estimates and actual acreage disturbed would vary.



CONSULTATION/COORDINATION

AGENCIES AND ORGANIZATIONS CONTACTED

The following agencies and organizations were contacted over the course of this study:

Federal Agencies

Advisory Council on Historic Preservation
Department of Agriculture
    Forest Service
Department of Interior
    Bureau of Indian Affairs
    Bureau of Land Management
    Fish and Wildlife Service
Department of Transportation
    Federal Highway Administration
Environmental Protection Agency

International Agencies

Province of British Columbia
Province of Alberta
Parks Canada

State, Local, and Other Agencies

Blackfeet Tribal Council
County Road Departments
Flathead County Commissioners
Flathead River Basin Environmental Impact Study
Flathead Tribal Council
Kalispell Chamber of Commerce
Montana Department of Fish, Wildlife, and Parks
Montana Department of Health and Environmental Sciences
Montana Department of Highways
Montana Department of Natural Resources and Conservation
Montana Planning Commission
Montana Public Service Commission
Montana State Historic Preservation Officer
Montana Tourism Bureau
Whitefish Chamber of Commerce

Other

Belton Chalets, Inc.
Coalition for Canyon Coalition
Environmental Information Center
Environmental Law Society
Flathead Coalition

Flathead Wildlife
Glacier National Park Foundation
Glacier National History Association
Glacier Park, Inc.
Glacier Park Boat Co.
Montana Wilderness Association (Flathead Chapter)
Montana Wildlife Federation
National Parks and Conservation Association
Rocky Mountain Outfitters
The Sierra Club (Montana Chapter)
The Wilderness Society
Wildlife Society Montana Chapter
Waterton Shoreline Cruises

APPENDIXES/REFERENCES/PLANNING TEAM

APPENDIX A: FORECAST METHODOLOGY AND ANALYSIS

Traffic Counts and Volumes

Traffic volumes during an interval of time less than a day more appropriately reflects the operating conditions of a roadway. For many rural types of conditions, a 1-hour period is the practical interval of time and defined as peak-hour traffic. The use of hourly volumes for planning and design of roadways indicates the variation in traffic occurring during various months of the year, days of the week, and hours of the day.

In analyzing traffic on Glacier National Park roads, it is important to consider hourly volumes during high-use periods and 24-hour counts during high-use periods recorded in July and August.

Limited traffic volume information is available for the park except for counts recorded at entrance stations. Hourly counts have not been recorded historically except in specific study situations. In July 1985, traffic counters that provide both daily and hourly counts were installed at five locations in the park. These counters provide data continuously over time the roadway is being used.

In 1951, the Montana State Highway Commission undertook a tourist survey of Glacier National Park. Selected traffic counts were recorded from June 15 to September 15.

As shown in table 5 of the text, the highest average daily traffic (ADT) in the park in 1951 was recorded at the West Glacier entrance station, amounting to 2,200 vehicles per day; Sunday volume during the week of August 12 to 18, 1951 amounted to 3,390 vehicles. The peak hour traffic was 340 on Sunday during the same time frame at the west entrance.

The ADT on Going-to-the-Sun Road in the Lake McDonald Lodge area was 1,380 on June 15 and 16 and 1,630 for July in 1951; no peak-hour figures were listed.

In 1967, traffic counts were recorded during the period of July 3 through 7 on Going-to-the-Sun Road between Logan Creek to east of Logan Pass. The ADT amounted to 2,310 and on July 4, the volume was 2,690. Peak-hour traffic on July 4 amounted to 370 vehicles per hour between 12:00 noon and 1:00 p.m.

The 1984 peak-day traffic amounted to 5,880; the 1984 ADT amounted to 4,790. The peak-hour figure amounted to 590 on a Sunday afternoon.

Of the locations recorded in table 5, the second-highest range of volumes occurred between Sprague Creek and Lake McDonald Lodge and 1.5 miles south of Avalanche Creek on Going-to-the-Sun Road.

July counts on Going-to-the-Sun Road 2.8 miles east of Logan Pass were as follows: ADT 2,680, peak day 3,680, and peak hour 440.

The counts west of Logan Pass at Work Camp amounted to 2,790 (ADT), 3,650 (peak day), and 460 (peak hour).

Traffic on other park roads is considerably lower than on Going-to-the-Sun Road. Many Glacier Road recorded a traffic volume of less than 50 percent of the level of the volume on Going-to-the-Sun Road. Chief Mountain Highway accommodated a volume at 25 to 35 percent of the level on Going-to-the-Sun Road.

The lowest counts in the park were recorded on Kintla Lake Road and the park's North Fork Road with 100 vehicles or less per day.

The Montana Department of Highways also recorded traffic counts in June 1984 on roads adjacent to the park and some of the park roads. An analysis of weekday traffic volumes on park roads

(Two Medicine, Chief Mountain, Many Glacier, and Going-to-the-Sun at St. Mary Entrance) indicates that volumes during June 25-27 were 34 to 44 percent of August volumes. These data highlight the seasonality of traffic volumes in the park.

High-use periods during the summer were considerably lower in 1985 than in 1984. From 1985 to 1986, volumes increased at approximately half the rate that they decreased from 1984 to 1985 except for Camas Road. The 1987 ADT was nearly at the same levels as 1986 ADT, except for Camas Road. The ADT on Camas Road increased over 20 percent between 1985 and 1986 and decreased over 22 percent between 1986 and 1987. From 1987 to 1988 ADT increased over 10 percent at all count stations.

Peak-day traffic volume recorded the same trend as high-use-period ADT for the three years. Peak-hour volumes were highest in 1984 at the five count stations other than at Camas Road where the 1986 peak-hour volume was higher than the 1984 volume.

Traffic Forecasts

Other major observations/presumptions used for traffic forecasts included the following (all references to ADT and traffic forecasts pertain to the July/August high-use period):

US 2 traffic west of the West Glacier entrance increased at a higher percent over the period from 1951 to 1988 than traffic at the west entrance.

Park traffic volumes will increase at slightly lower levels than for the state highways in Montana.

In all probability, park traffic volumes should increase at a constant rate except for the west side of the park and, possibly, short road segments. Volume increases may be greater on the west side than the east side due to expected growth and development in the Flathead Valley.

Park visitation might increase at a higher rate than vehicular travel due to use of other modes of transportation. Historically, park visitation has grown at a slightly greater rate than vehicular volumes.

It is estimated that peak-hour volumes on Going-to-the-Sun Road will increase at approximately 70 percent of the rate of ADT based on historical figures. When the capacity of the roadway is reached, peak-hour volumes will stabilize but ADT can continue to increase. As traffic increases on Going-to-the-Sun Road and congestion increases, the capacity of the roadway will be reached more frequently. This will probably result in the lengthening of the number of hours of high-traffic levels. This is currently occurring to a slight degree. Some of the peak-hour travel in July and August occurred later in the afternoons with high levels of traffic before and after the peak hours.

As a maximum forecast, ADT is estimated to increase by 7.5 percent from 1987 to 1992 and the peak-hour traffic should increase by 5 percent to 1992. Also, as a maximum, ADT is estimated to increase by 30 percent by the year 2007. Peak-hour traffic should increase by 21 percent over the same period.

Forecast Analysis

One phase in forecasting potential bus loadings was to determine a maximum number of visitors that might ride a park bus or van. The trailhead survey conducted during the first part of August 1984 indicated that 30 percent of the day use trail hikers came to the trailhead by means other than a private vehicle. The survey also indicated that 20 percent of those surveyed came to the park by means other than private vehicles. It should be noted that these statistics are derived from the trail users surveyed over a 10-day period in August 1984.

Approximately 90 percent of the Amtrak passengers arriving at East and West Glacier (Belton) were bound for the park. In July 1984 East Glacier averaged 53 park visitors per day and Belton 19 per day. Based on information from car rental agencies at Glacier Park International Airport, approximately 50 people per day were destined for Glacier in July and August of 1984.

Based on information from Glacier Park, Incorporated (GPI), 3,030 passengers rode concessioner buses in June of 1984, 7,925 in July, 9,133 in August, and 1,634 in September, for a total of 21,722 passengers on mainly one-way trips and some round- trips on the Circle Tour route.

As a guide, it was presumed that:

> 20 percent of the lodgers at GPI facilities would ride a bus; 18 to 20 percent used GPI buses in 1984.
>
> 10 percent of the campground users would ride a bus (indication from the 1984 trailhead survey).
>
> 30 percent of concession and park employees staying in the park would ride a bus regularly.

Average-daily-visitation figures by month includes all of the visitation occurring over that particular month. In arriving at the number of potential bus passengers, average-day loadings are most important for projecting the number of passenger loadings by month and consequently the total for the operating season.

On high-use days, the average-daily passenger loading would be exceeded. If high-use day passengers were all transported, additional buses and drivers might be required, which would result in additional trip mileage and driver time.

It might not be practical or feasible to accommodate potential loadings on a peak day (highest use day of season or month) but it might be realistic and necessary to transport most of the potential passengers on high-use days. In arriving at high-use-day projections, average-day and high-use-day data for 1984 were analyzed for vehicular traffic, entrance-station entries, and campground use. High-use-day data varied between 20 percent to over 100 percent higher than average-use-day data. In the higher-use months, July and August, it appeared that a high-use day recorded approximately 30 percent more activity than on an average-use day. In determining projection factors for potential bus loadings, it was presumed that high-use days would record a level of activity 30 percent higher than on average-use days.

Vehicle Types

The types of vehicles used in the park are summarized below:

Standard Van:

- 138" wheel base standard production van altered to increase headroom
- 10 passengers with the back seat removed for luggage

Modified Maxi Van:

- 138" wheel base standard production van altered to increase headroom/luggage rack at the rear
- 15 passengers

Light transit vehicle constructed from a van chassis or construction or a bus body on a heavy-duty van chassis or light truck chassis:

- 138-inch + wheel base
- Up to 25 passengers

Modified school bus to accommodate adult passengers:

- 125-inch to 218-inch wheel base (189.5-inch probably maximum to be used on Going-to-the-Sun Road)
- Up to 28 passengers on 189.5-inch wheel base

Light bus constructed on a light to medium truck chassis:

- 125-inch to 218-inch wheelbase
- Up to 31 passengers on 189.5-inch wheel base

BUS ROUTES AND SCHEDULES

The following schedules and routes were used from 1986-1988.

Round Trips

From Glacier Park Lodge to Two Medicine (TM)

Depart	Arrive TM	Depart TM	Arrive
9:30 a.m.	10:15 a.m.	11:30 a.m.	12:00 noon
1:30 p.m.	2:15 p.m.	4:30 p.m.	5:00 p.m.

From St. Mary visitor center to Jackson Glacier Overlook (JGO)

Depart	Arrive JGO	Depart JGO	Arrive
9:30 a.m.	10:30 a.m.	3:05 p.m.	4:00 p.m.

One-Way Trips

From:	Glacier Park Lodge		
To:	Many Glacier Hotel	8:15 a.m.	10:00 a.m.
	Prince of Wales Hotel	8:15 a.m.	12:00 noon
	St. Mary	8:15 a.m.	9:15 a.m.
	Rising Sun	8:15 a.m.	9:30 a.m.
	Logan Pass	8:15 a.m.	10:40 a.m.
	Prince of Wales via Many Glacier	8:15 a.m.	12:00 noon
	Lake McDonald via Logan Pass	8:15 a.m.	12:15 p.m.
From:	Many Glacier Hotel		
To:	Glacier Park Lodge	10:20 a.m.	12:00 noon
	Prince of Wales Hotel	10:15 a.m.	12:00 noon
	St. Mary	8:30 a.m.	9:15 a.m.
		2:30 p.m.	3:15 p.m.
	Rising Sun	8:30 a.m.	9:40 a.m.
		2:30 p.m.	3:40 p.m.
	Logan Pass	8:30 a.m.	10:50 a.m.
		2:30 p.m.	4:50 p.m.
	Lake McDonald Lodge	8:30 a.m.	12:15 p.m.
		2:30 p.m.	6:00 p.m.
From:	Lake McDonald Lodge		
To:	Many Glacier Hotel	8:30 a.m.	12:15 p.m.
		1:30 p.m.	5:15 p.m.
	Glacier Park Lodge via Logan Pass	1:30 p.m.	5:15 p.m.
	Glacier Park Lodge via US 2	9:00 a.m.	11:30 a.m.
	Belton (Tour coach leaves 45 minutes before train arrival)		
	Logan Pass	8:30 a.m.	9:30 a.m.
		1:30 p.m.	2:30 p.m.
	Rising Sun	8:30 a.m.	10:30 a.m.
		1:30 p.m.	3:30 p.m.
	St. Mary	8:30 a.m.	11:00 a.m.
		1:30 p.m.	4:00 p.m.
	Loop	8:30 a.m.	9:15 a.m.
		1:30 p.m.	2:15 p.m.
From:	St. Mary visitor center		
To:	Lake McDonald Lodge	9:30 a.m.	12:15 p.m.
		3:30 p.m.	6:00 p.m.
	Logan Pass	9:30 a.m.	10:50 a.m.
		3:30 p.m.	4:50 p.m.
	Many Glacier Hotel	9:30 a.m.	10:15 a.m.
		4:30 p.m.	5:15 p.m.
	Glacier Park Lodge	11:15 a.m.	12:00 noon
		4:00 p.m.	5:15 p.m.
	Prince of Wales Hotel	9:30 a.m.	12:00 noon
From:	Prince of Wales Hotel		
To:	Many Glacier Hotel	8:15 a.m.	10:00 a.m.
	Glacier Park Lodge	8:15 a.m.	12:00 noon
	St. Mary	8:15 a.m.	11:00 a.m.

From:	Belton		
To:	Logan Pass Apgar Village Inn Lake McDonald Lodge Rising Sun St. Mary	Departure and arrival times are based on train schedules and connections at Lake McDonald Lodge	
From:	Rising Sun		
To:	St. Mary	10:30 a.m. 3:50 p.m.	10:40 a.m. 4:00 p.m.

Full-Day Tour from Glacier Park Lodge

Depart Glacier Park Lodge	8:15 a.m.
Arrive St. Mary visitor center	9:15 a.m.
Depart St. Mary visitor center	9:30 a.m.
Arrive Lake McDonald Lodge	12:15 p.m.
Depart Lake McDonald Lodge	1:30 p.m.
Arrive St. Mary visitor center	3:45 p.m.
Depart St. Mary visitor center	4:00 p.m.
Return Glacier Park Lodge	5:15 p.m.

Full-Day Tour from Lake McDonald Lodge

Depart Lake McDonald Lodge	8:30 a.m.	Via Going-to-the-Sun Road
Arrive Many Glacier Hotel	12:15 p.m.	
Depart Many Glacier Hotel	2:30 p.m.	Via Going-to-the-Sun Road
Return Lake McDonald Lodge	6:00 p.m.	

Full-Day Tour from Many Glacier Hotel

Depart Many Glacier Hotel	8:30 a.m.	Via Going-to-the-Sun Road
Arrive Lake McDonald Lodge	12:15 p.m.	
Depart Lake McDonald Lodge	1:30 p.m.	Via Going-to-the-Sun Road
Arrive Many Glacier Hotel	5:15 p.m.	

Based on existing needs and conditions, the following routes and stops were selected for analysis:

West Glacier to St. Mary with stops at:

- Proposed visitor center
- Belton railroad station (when trains arrive/depart)
- West Glacier
- Fish Creek campground
- Apgar Village
- Apgar campground
- Sprague Creek campground
- Lake McDonald Lodge
- Sacred Dancing Cascade
- Avalanche Creek campground
- Loop
- Logan Pass
- Siyeh Bend
- Jackson Glacier overlook

St. Mary Falls
Sunrift Gorge
Sun Point
Rising Sun
St. Mary campground
St. Mary visitor center
St. Mary Village

Many Glacier to St. Mary with stops at:

Many Glacier Motel
Swiftcurrent Motel
Swiftcurrent picnic area
Appekuny trail head
St. Mary Village
St. Mary visitor center

Operational aspects of the routes include the following:

West Glacier to St. Mary/St. Mary to West Glacier	
Round-trip length	120.0 miles
Stop time at bus stops	1 hr and 20 min + 50 min at St. Mary and West Glacier
Running time	4 hr and 50 min
Average running time	25 miles/hour
Total trip time for 1 trip	7 hours

St. Mary to Many Glacier/Many Glacier to St. Mary	
Round-trip length	48.0 miles
Stop time at bus stops	20 min + 30 min at St. Mary and Many Glacier
Running time	1 hr and 40 min
Average running time	29 miles/hour
Total trip time for 1 trip	2 hr and 30 min

The stop times were estimated based on the number of stops with varying lengths of time for the activity at the stop. For example, at route origins and destinations, 50 minutes were allocated at St. Mary and West Glacier and 30 minutes at Many Glacier and St. Mary for the two respective routes. Five minutes per stop were also estimated for stops at major activity areas, two minutes were allocated for most of the campgrounds and one minute for trailheads.

Operating times were selected based on traffic-volume trends during the day and information from park and GPI staff. From traffic-count data collected during August 1984, vehicular movements increased rapidly at approximately 9:00 a.m. and decreased considerably between 6:00 p.m. and 8:00 p.m. On Going-to-the-Sun Road with heavier traffic volumes and visitor use, it would be desirable in July and August to maintain bus schedules every 30 minutes to encourage convenient and flexible use. The bus options incorporated this basic operational schedule for routes on Going-to-the-Sun Road in July and August with one-hour headways for the remainder of the season. The basic schedule between St. Mary and Many Glacier was one hour for the full season. Operating time and scheduled trips are shown below for the potential routes for forecasting purposes.

West Glacier to St. Mary and St. Mary to West Glacier		
June and September	8:00 a.m. to approx.	11:00 p.m.
14 trips per day – 1 trip per hour		
July and August	8:00 a.m. to approx.	11:00 p.m.
24 trips per day – 2 trips per hour		

For all months, one bus each would also depart at 6:00 a.m. from West Glacier to St. Mary and from St. Mary to West Glacier.

Many Glacier to St. Mary and St. Mary to Many Glacier

Full season 8:00 a.m. to approximately 8:30 p.m. – 13 trips per day – 1 trip per hour

When passenger demand exceeded the capacity of the scheduled buses, additional buses could be added at scheduled departures or in between departures to shorten headways (i.e., 1 bus every 15 minutes, etc.)

Capital and Operating Costs

As indicated previously, three sizes of vehicles were used in the forecast analysis. The costs for each type of vehicle were estimated as follows:

25-passenger bus:

Capital costs – $48,300
Annualized capital costs – $8,595
Operating costs – $.85 per mile

15-passenger maxi-van:

Capital costs – $27,775
Annualized capital costs – $5,025
Operating costs – $.70 per mile

10-passenger van:

Capital costs – $25,950
Annualized capital costs – $4,700
Operating costs – $.70 per mile

Annualized capital costs considered a vehicle life of 9 years with a vehicle salvage value of 10 percent and an interest rate of 12 percent (capital recovery interest factor). Annual and annualized costs are defined as taking all of the total costs and reducing them to an equivalent uniform annual series of payments. In short, annual cost is defined as equivalent uniform annual cost.

The annualized operating cost for vehicles includes all maintenance, insurance, licensing, and social security tax expenses.

The capital costs and capital costs annualized includes amortization of capital costs for maintenance and dormitory space for drivers but does not include costs for other ancillary support facilities such as enclosed space for winter storage of buses, parking/staging areas, bus shelters (if desired), and ticket sales areas and comfort stations if not accommodated in existing facilities.

Drivers wages were estimated at $6.60 per hour including fringe benefits. Labor costs were estimated for total hours for regular and relief drivers operating the system based on seven days per week for each of the shuttle options.

Support Facilities

The maintenance facility might be best located at St. Mary because it could also serve a St. Mary/Many Glacier route. The space and cost estimates are as follows:

Dormitories (not winterized))

West Glacier	12 rooms X 300 sq ft/room + a common area of 300 sq ft =3,900 sq ft
St. Mary	15 rooms X 300 sq ft/room + a common area of 300 sq ft 4,800 sq ft
Estimated Costs	8,700 sq ft X $94/sq ft X 1.60 (design, construction, and supervision costs) = $1,308,480
Maintenance Facility at St. Mary	75 sq ft X 72 sq ft building (not winterized) with 3 lift bays, 3 pits, and 4 flat bays and dispatchers space totals 5,400 sq ft X $105/sq ft X 1.35 = $765,450
Land at St. Mary	2 acres for dormitory and maintenance facility X $6,050/acre = $12,1000

The dormitory at West Glacier could possibly be constructed on park land but park land area is limited in the St. Mary area. The annualized costs are shown in table A-1.

Table A-1: Estimated Annual Support Facility Costs

Annual Cost	
Dormitories and Maintenance Facility*	$220,270
Land**	$ 1,274
Operation and Maintenance Costs	$ 12,075
Total Estimated Annual Costs	**$233,619**

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*30-year amortization with one-third salvage value and 10 percent interest rate

**30-year amortization with 10 percent interest rate – probably be amortized much sooner but used 30 years for comparability to annualized structures costs.

APPENDIX B: ROAD CLASSIFICATION PLAN

The classification of the roads in Glacier National Park is based on the functional classification system described in NPS *Park Road Standards* (NPS 1984b). Each park segment has been classified, according to its intended use or function, as a public use road or an administrative road.

Public Use Roads

All roads intended principally for the use of visitors for access into and within Glacier National Park are classified as public use roads. These roads are defined in the *NPS Road Standards* and subdivided into the following four classes:

> Class I: Principal Road/Rural Parkway – This road class includes main access routes, circulatory tour routes, or thoroughfares for visitors.
>
> Class II: Connector Road – Connector roads provide access to areas of scenic, scientific, recreational, or cultural interest, such as overlooks, campground, trailheads etc.
>
> Class III: Special Purpose Road – Special purpose roads provide circulation within public use areas, such as campgrounds, picnic areas, visitor center complexes, and concessioner facilities. They generally serve low-speed traffic and are often designed for one-way circulation.
>
> Class IV: Primitive Road – Primitive roads provide circulation through remote areas and/or access to primitive campgrounds and undeveloped areas. They frequently have no minimum design standards, and their use may be limited to specially equipped vehicles.

Administrative Roads

The administrative road category consists of all public and nonpublic roads intended principally for administrative uses. Administrative roads are subdivided into two classes:

> Class V: Administrative Access Road – This class includes all public roads intended for access to administrative developments or structures, such as offices, employee quarters, or utility areas.
>
> Class VI: Restricted Road – Restricted roads are normally closed to the public. They include patrol roads, fire roads, truck trails, and other similar roads.

Access to Glacier National Park is provided by county roads and state and federal highways. All six classes of park roads noted above are present in Glacier National Park.

The class I roads in the park include Going-to-the-Sun Road, Camas Road, Two Medicine Road, Many Glacier Road, and Chief Mountain Highway. The most prominent class II road is North Fork Road in the park. It could be considered as a class I road if all visitors used the North Fork Road from Apgar to Polebridge and Kintla and Bowman lakes. However, a good portion of the vehicular traffic from Apgar to the North Fork Area uses Camas Road and County Road 489 north to Polebridge rather than North Fork Road.

The Road Classification Plan maps show the categories into which park roads have been placed. Table B-1 is the road system inventory for the entire park.

Table B-1: Road System Inventory
Glacier National Park

Rt. No.	Road Name	Road Segment From/To	Functional Class.	Length (Miles)	Purpose/Function	ADT	Terrain	Road Use Period	Traveled Surface Width (ft)	Shoulder Width (ft)	Traveled/ Shoulder Surface	Av. Op. Speed (MPH)
10	Going-to-the-Sun Road – Sec. 1	West Glacier Park Bdry to 0.55 mi E Jct Rt 11 (Camas Rd)	I	2.27	Principal access route to most major facilities, developments, and park features	4500	Flat	All Year	28	2	Paved/	45
	Sec.2	0.55 mi. E. Jct Rt 11 (Camas Rd) to Lake McDonald Ranger Stat. rd.		9.83		3410	Flat to moderately rugged	All Year	22	1-5	Paved/Turf	45
	Sec. 3	Lake McDonald Ran. Sta. Rd to 0.44 mi north of Logan Cr. Bridge		8.97		2750 2960	Flat to to moderately rugged	May-Nov	22	0-3	Paved/Turf	45
	Sec. 4	0.44 mi N. Logan Cr. Bridge to West Portal West Tunnel		2.28		2750	Moderately rugged to rugged	May-Nov	22	0	Paved/NA	35
	Sec. 5	West Portal of West Tunnel to Logan Pass Summit		8.41		2750	Mountainous Rugged to precipitous	Jun-Oct	18-21	0-3	Paved/NA	25
	Sec. 6	Logan Pass Summit to St. Mary Falls trailhead		6.89		2680	Rugged to precipitous	Jun-Oct	22-23	0	Paved/NA	35
	Sec. 7	St. Mary Falls trailhead to Rising Sun		5.00		2680	Moderately rugged	May-Oct	21-22	1-4	Paved/ Gravel	35
	Sec. 8	Rising Sun to jct US 89 at St. Mary		6.14		3110	Rolling	Apr-Oct	21-22	1-3	Paved/ Gravel	35
		Total Length		**49.79**								
	Camas Rd	Jct. Rt 10 to Jct Co Rd 486 (North Fork Flathead River)	I	11.66	Entrance and access road for sw section	520	Rolling	Apr-Nov	27	2	Paved/Paved & Turf	45

Rt. No.	Road Name	Road Segment From/To	Functional Class.	Length (Miles)	Purpose/Function	ADT	Terrain	Road Use Period	Traveled Surface Width (ft)	Shoulder Width (ft)	Traveled/ Shoulder Surface	Av. Op. Speed (MPH)
12	Two Medicine Rd	Jct SR 49 to Two Medicine Lake	I	7.21	Access road to Two Medicine Lake area & associated facilities and features	620	Rolling	Apr-Dec	26	2	Paved/Paved & Turf	35
13	Chief Mountain Highway	Jct US 89 to international Bdry (only 3.55 mi within park boundary	I	14.22	Access road to international boundary and Goat Haunt	1040	Rolling	May-Sept	28	3	Paved/Paved & turf	45
14	Many Glacier Road Sec. 1	Jct US 89 at Babb to park entrance gate	I	4.86	Access route to Many Glacier and Swiftcurrent	1440	Rolling	Apr-Dec	24	2	Paved/Gravel	45
	Sec. 2	Park entrance gate to Swiftcurrent Lodge parking area		7.54		1440	Rolling to moderately rugged	Apr-Dec	24	2	Paved/Gravel	45
		Total Length		**12.40**								
100	North Fork Rd Sec. 1	Jct Rt 11 to end of pavement at Fish Creek campground	II	1.13	Access route to park's west side facilities and features	350	Rolling	May-Oct	26	2	Paved/Paved	45
	Sec. 2	End of pavement at Fish Creek campground to Dutch Creek		9.63		140	Rolling	May-Nov	12-16	0	Gravel/NA	20-30
	Sec. 3	Dutch Creek Bridge to jct Rt 913 (Polebridge Rd)		15.57		70	Rolling	May-Nov	-16	0	Gravel/NA	20-30
	Sec. 4	Jct Rt 913 (Polebridge Rd) to Kintla Lake campground		14.03		130	Flat to rolling	May-Nov	11-16	0	Gravel/NA	20-30
		Total Length		**40.36**								
101	Apgar Loop Rd	Jct Rt 11 to East and Apgar village parking areas	II	0.27	Access to Apgar village and campground	1080	Flat	All Year	20-22	0	Paved/NA	25

Rt. No.	Road Name	Road Segment From/To	Functional Class.	Length (Miles)	Purpose/Function	ADT	Terrain	Road Use Period	Traveled Surface Width (ft)	Shoulder Width (ft)	Traveled/ Shoulder Surface	Av. Op. Speed (MPH)
102	St. Mary Res. Rd	Jct Rt 10 through St. Mary Res. Area	II	0.64	Access road to St. Mary residential area	50	Flat	All Year			Paved	15
200	Lake McDonald Lodge Loop	Jct Rt 10 – Loop into Lake McDonald Lodge to Rt 10	III	0.52	Access and circulation	800	Flat	All Year			Paved	15-25
201	Avalanche Campground Road	Jct Rt 10 through Avalanche Campground	III	089	Access and circulation	100	Rolling	May-Oct			Paved	15
202	Lake McDonald Ranger Stat. Rd	Jct Rt 10 to Arrow Lake Trailhead	II	2.52	Access to ranger station	10	Rolling	Apr-Nov			Dirt	
203	Sprague Cr. Campground	Jct Rt 10 through Sprague Creek campground	III	0.34	Access and circulation	20	Rolling	May-Oct			Paved	15
204	Fish Cr. Campground	Jct Rt 100 through campground	III	1.64	Access and circulation	30	Rolling	May-Oct			Paved	15
205	Apgar Campground	Jct Rt 101 through campground	III	2.36	Access and circulation	75	Flat	May-Oct			Paved	15
206	Apgar Stable Rd	Jct Rt 10 to end of pavement	II	0.80	Access to stables	15	Flat	All Year	22	0	Paved	15-25
207	Two Medicine Campground	Jct Rt 12 through campground	III	1.57	Access and circulation	25	Rolling	May-Oct			Paved	15
209	Many Glacier campground	Jct Rt 14 into Many Glacier campground	III	0.87	Access road to Many Glacier campground	25	Rolling	Apr-Dec			Paved	15

Rt. No.	Road Name	Road Segment From/To	Functional Class.	Length (Miles)	Purpose/Function	ADT	Terrain	Road Use Period	Traveled Surface Width (ft)	Shoulder Width (ft)	Traveled/ Shoulder Surface	Av. Op. Speed (MPH)
210	Many Glacier Hotel Rd/ Parking	Jct Rt 14 to Many Glacier Hotel	III	0.68	Access road to Many Glacier Hotel and parking	1440	Rolling	Apr-Dec	18-20	0-10	Paved/Gravel	15
211	Sun Point Rd	Intersection Rt 10 at MP 39.83 to Sun Point parking area	II	0.26	Access to parking area, hiking trail and scenic overlook	50	Moderately rugged	Jun-Oct	20	3	Paved/Gravel	35
212	Rising Sun Lodge Rd	Jct Rt 10 to Rising Sun Lodge	III	0.57	Lodge access road	100	Flat to rolling	Apr-Oct	Variable		Paved/ Gravel & Turf	10-25
213	Rising Sun Campground	Jct Rt 212 through campground	III	0.80	Campground circulation	25	Flat to rolling	May-Sept			Paved	15
214	St. Mary Campground	Jct Rt 10 through St. Mary campground	III	1.73	Access and circulation	50	Rolling	Apr Nov			Paved	15
219	Cut Bank Rd	Jct US 89 to Rd end at Cut Bank Creek campground	II	5.19	Access to Cut Bank ranger station and campground	50	Rolling	May-Oct	16	0	Gravel/NA	25
221	Bowman Lake Rd & Campground	Jct Rt 100 to Bowman Lake Campground	II	5.91	Access road to Bowman Lake facilities	130	Rolling	Apr-Nov	11-12	0	Gravel/NA	5-25
226	St. Mary 1913 Rang. Stat. Rd	Jct Rt 102 to parking lot	V	0.31	Access to historic ranger station	50	Flat				Gravel	
400	Hdqtrs. Area Rds	Jct Rt 10 through Apgar hdqtrs.	V	2.09	Access and circulation	100	Flat	All Year	20-22		Paved	15
401	Many Glacier Res. Area	Jct Rt 209 into Many Glacier res. area	V	0.25	Access road into Many Glacier residential area	15	Rolling				Paved	15
402	St. Mary Res. Area Rd	Jct Rt 102 through residential area	V	0.72	Circulation through St. Mary residential area	15	Flat				Paved	

Rt. No.	Road Name	Road Segment From/To	Functional Class.	Length (Miles)	Purpose/Function	ADT	Terrain	Road Use Period	Traveled Surface Width (ft)	Shoulder Width (ft)	Traveled/ Shoulder Surface	Av. Op. Speed (MPH)
403	Packers Roost Rd	Rt 10 to end	II	0.60		15	Mountainous Moderately rugged	May-Oct	10 (1 lane)	0	Gravel/ NA	15
404	Apgar Res. Rd	Jct Rt 11 to end	V	0.96	Access to residences	10	Rolling				Gravel	
405	YCC camp Road	Jct Rt 206 to camp	V	0.39	Access to camp	5	Flat				Dirt	
406	Quarter Circle Bridge Rd	Jct Rt 206 to trailhead	II	0.24	Trailhead parking	20	Rolling				Paved/NA	
407	Goat Lick Vista Rd & Parking	Jct US 2 to end	III		Parking area		Flat to rolling				Paved/NA	
900	Hdqtrs. Service Area Parking		III		Parking area	25	Flat				Paved/NA	
901	Fish Cr. Picnic Area Parking		III		Parking area	30	Flat				Paved/NA	
902	Fish Cr. Amphitheater parking		III		Parking area	20	Flat				Paved/NA	
903	Bowman Lake Picnic Rd & Parking Area		III		Parking area	10	Flat				Gravel/NA	
904	Rising Sun Boat Launch & Parking		III		Parking area	50	Flat				Paved/NA	
905	St. Mary VC Parking		III		Parking area	350	Flat				Paved/NA	
906	St. Mary Maintenance Area/Parking		V		Parking area	15	Flat				Paved/NA	

Rt. No.	Road Name	Road Segment From/To	Functional Class.	Length (Miles)	Purpose/Function	ADT	Terrain	Road Use Period	Traveled Surface Width (ft)	Shoulder Width (ft)	Traveled/ Shoulder Surface	Av. Op. Speed (MPH)
907	Many Glacier Picnic Rd	Jct Rt 14 into Many Glacier picnic area rd	III		Parking area	20	Flat				Paved/NA	
908	Logan Pass VC Parking		III		Parking area	350	Flat				Paved/NA	
909	Lake McDonald Lodge Parking		III		Parking area	100	Flat				Paved/NA	
910	Two Medicine Parking Area		III		Parking area	25	Flat				Paved/NA	
911	Sun Point Parking Area		III		Parking Area	25	Flat				Paved/NA	
913	Polebridge Ranger St. Road	West park bdry to Jct Rt 100	II	0.23	Access to Polebridge ranger station	50	Rolling	May-Dec	18	0	Gravel/NA	15
914	Swiftcurrent rent cab. RD/parking	Swiftcurrent Lodge vicinity	III	0.40	Parking area for Swiftcurrent cabins		Rolling	Apr-Dec	14	0	Paved/NA	10-15
915	Apgar Picnic Loop		III	0.20	Parking for picnic area		Flat				Paved/NA	
916	Huckleberry Mt Trailhead		III	0.22	Access to trailhead						Dirt/NA	
917	Avalanche Picnic Area		III	0.22	Parking area		Flat				Paved/NA	
918	Rising Sun Picnic Area & Parking		III	0.32	Parking area		Flat				Paved/Na	
919	Walton Ranger Station		III	0.13	Parking area		Flat				Paved & Gravel N/A	

Rt. No.	Road Name	Road Segment From/To	Functional Class.	Length (Miles)	Purpose/Function	ADT	Terrain	Road Use Period	Traveled Surface Width (ft)	Shoulder Width (ft)	Traveled/ Shoulder Surface	Av. Op. Speed (MPH)
920	River Campground/ Parking		III	0.12	Parking for campground		Flat				Dirt/NA	
921	Bowman Cr. Campground Roads		III	0.17	Access and circulation		Flat to rolling				Dirt/NA	
922	Quartz Cr. Campground		III	0.23	Parking for campground		Flat				Gravel/NA	
923	Logging Cr. Campground		III	0.10	Parking for campground		Flat				Gravel/NA	

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As the nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural and cultural resources. This includes fostering wise use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people. The department also promotes the goals of the Take Pride in America campaign by encouraging stewardship and citizen responsibility for the public lands and promoting citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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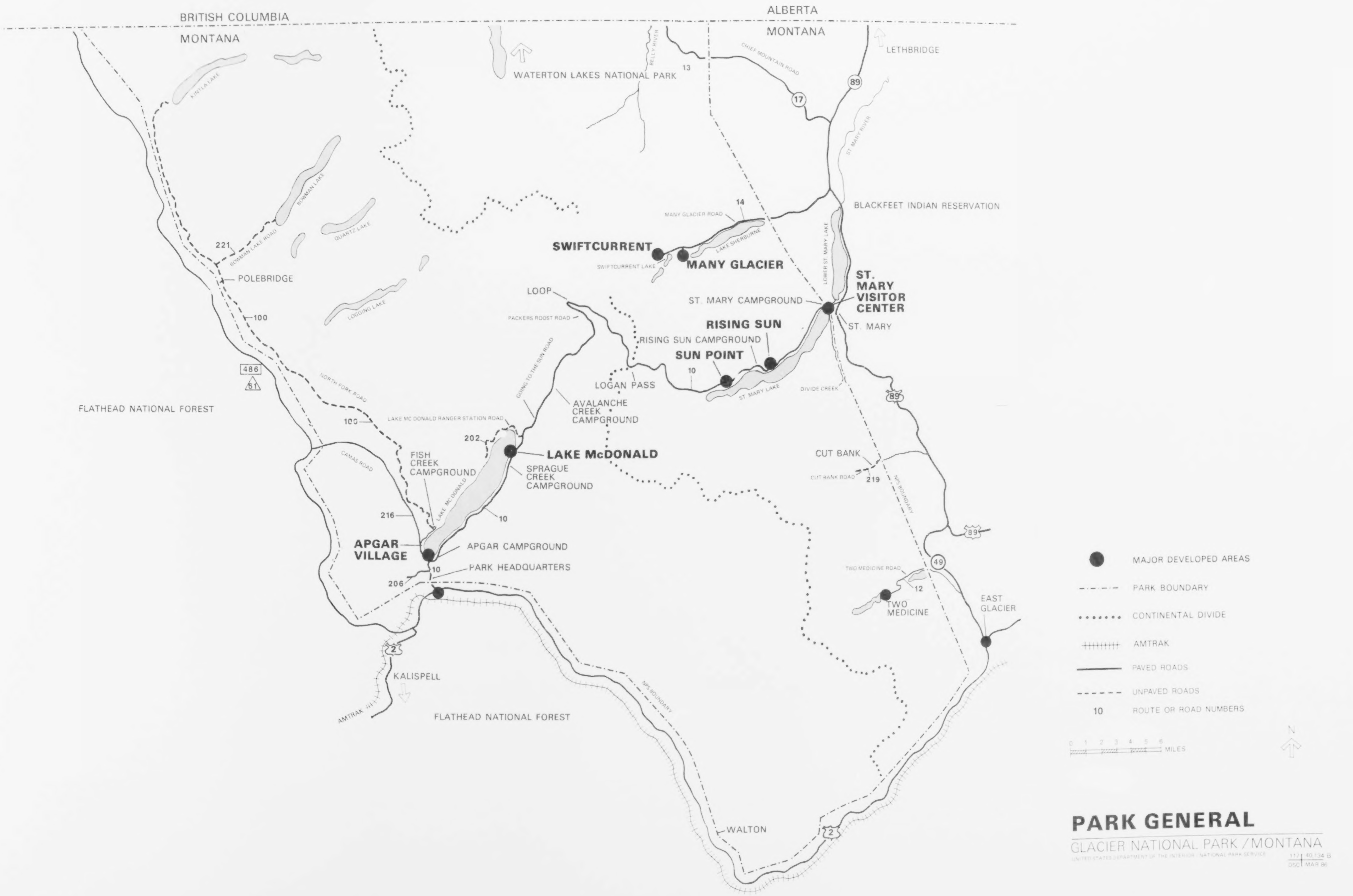
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MANY GLACIER ROAD
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LOWER ST. MARY LAKE
ST. MARY VISITOR CENTER
ST. MARY CAMPGROUND
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GOING TO THE SUN ROAD
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APGAR VILLAGE
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PARK HEADQUARTERS
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UNITED STATES DEPARTMENT OF THE INTERIOR / NATIONAL PARK SERVICE

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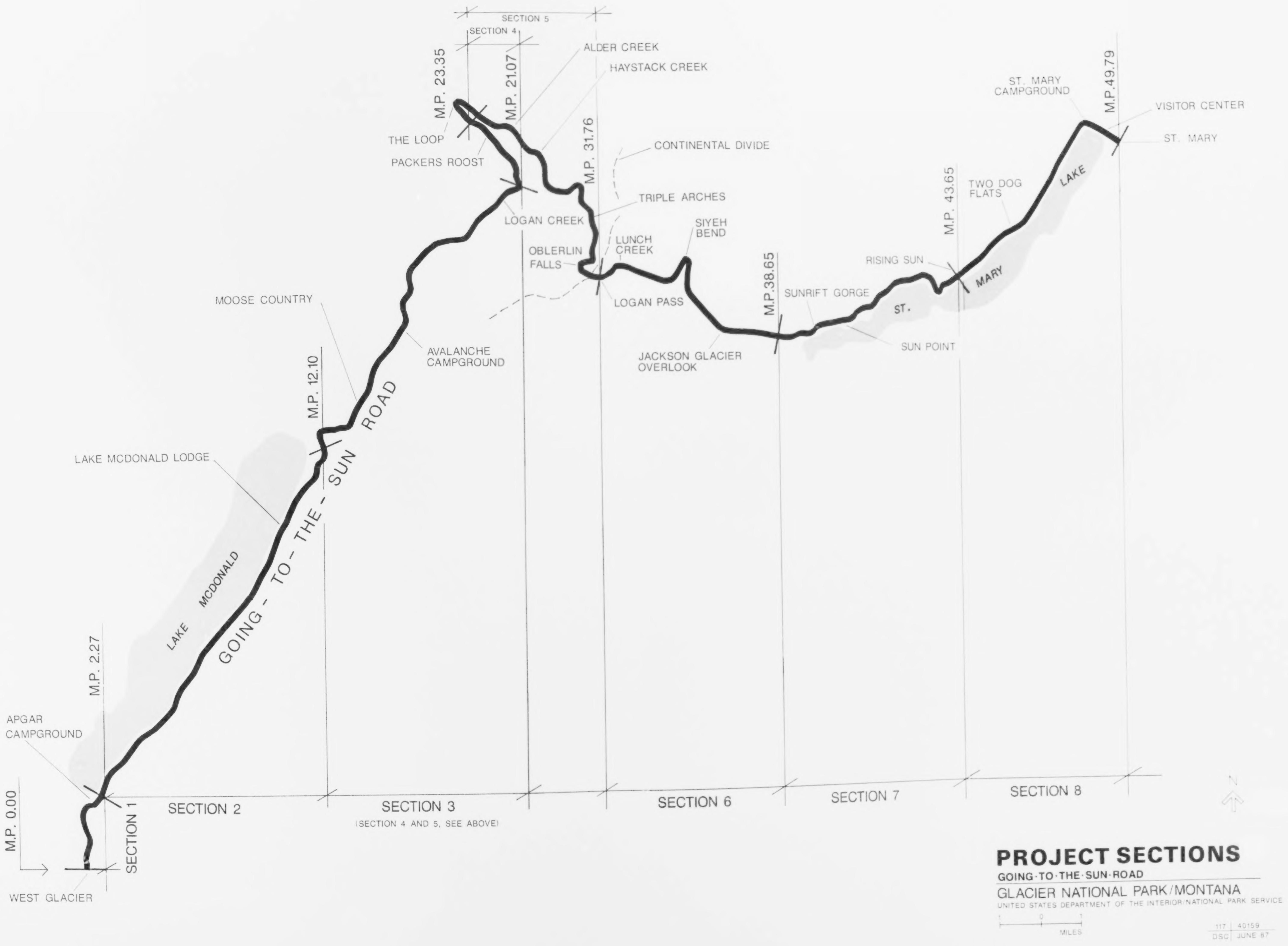
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CONTINENTAL DIVIDE
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(SECTION 4 AND 5, SEE ABOVE)
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PROJECT SECTIONS

GOING·TO·THE·SUN·ROAD

GLACIER NATIONAL PARK/MONTANA

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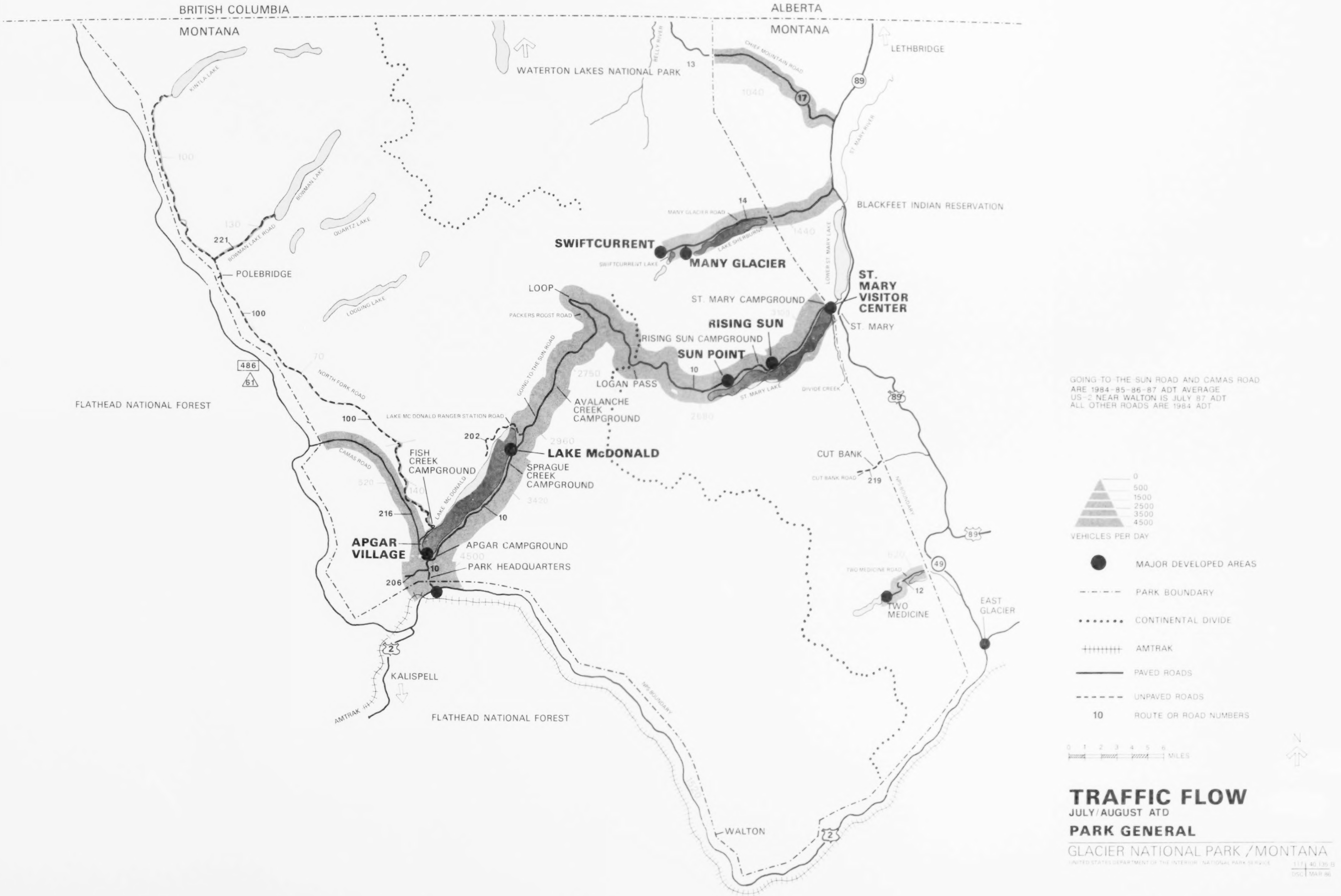
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GOING TO THE SUN ROAD AND CAMAS ROAD
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ALL OTHER ROADS ARE 1984 ADT

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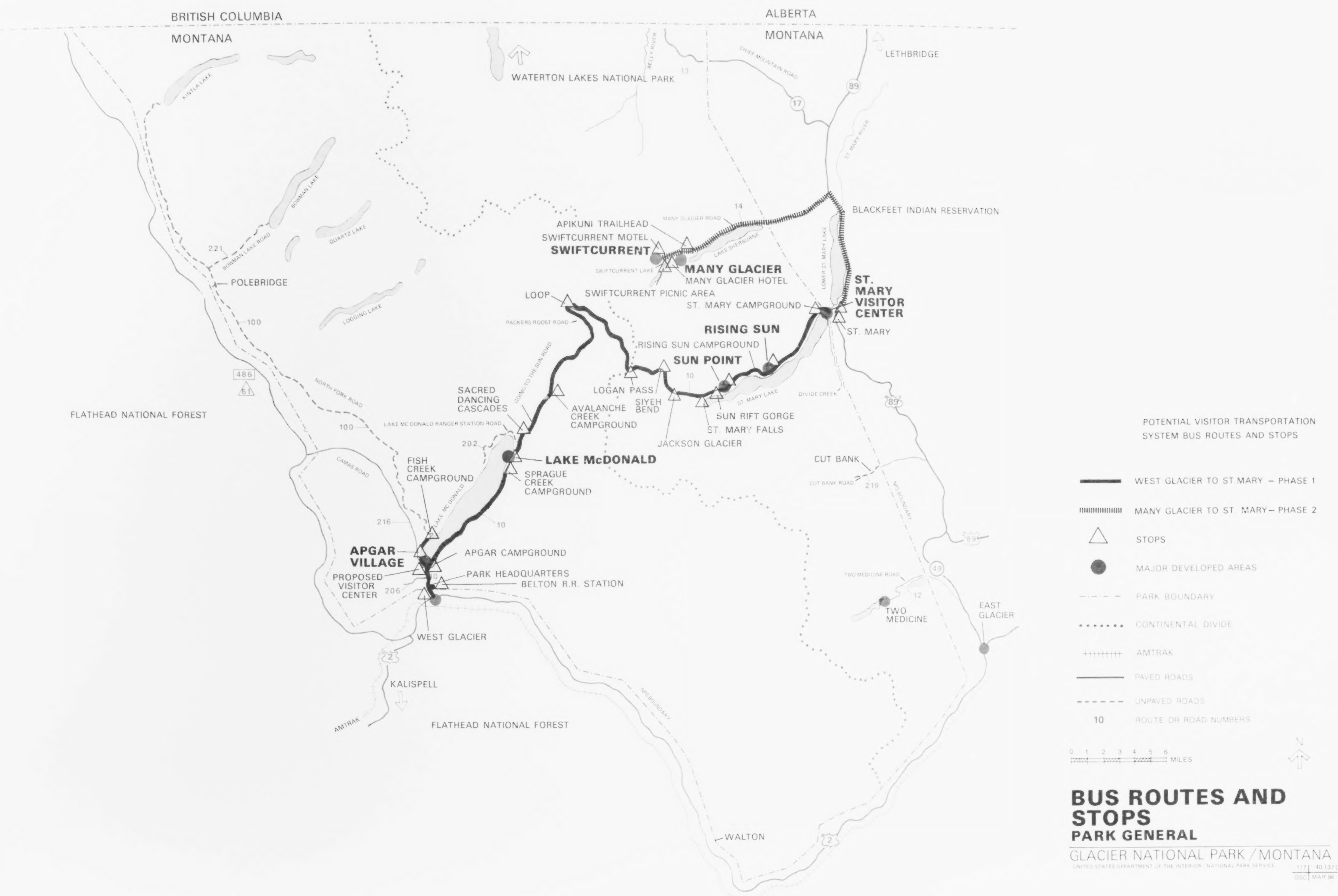
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ST. MARY FALLS
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SACRED DANCING CASCADES
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LAKE McDONALD
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CAMAS ROAD
FISH CREEK CAMPGROUND
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APGAR CAMPGROUND
PROPOSED VISITOR CENTER
PARK HEADQUARTERS
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CUT BANK
CUT BANK ROAD
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NPS BOUNDARY
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TWO MEDICINE ROAD
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POTENTIAL VISITOR TRANSPORTATION SYSTEM BUS ROUTES AND STOPS
WEST GLACIER TO ST.MARY – PHASE 1
MANY GLACIER TO ST. MARY – PHASE 2
STOPS
MAJOR DEVELOPED AREAS
PARK BOUNDARY
CONTINENTAL DIVIDE
AMTRAK
PAVED ROADS
UNPAVED ROADS
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ROUTE OR ROAD NUMBERS
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BUS ROUTES AND STOPS
PARK GENERAL

GLACIER NATIONAL PARK / MONTANA

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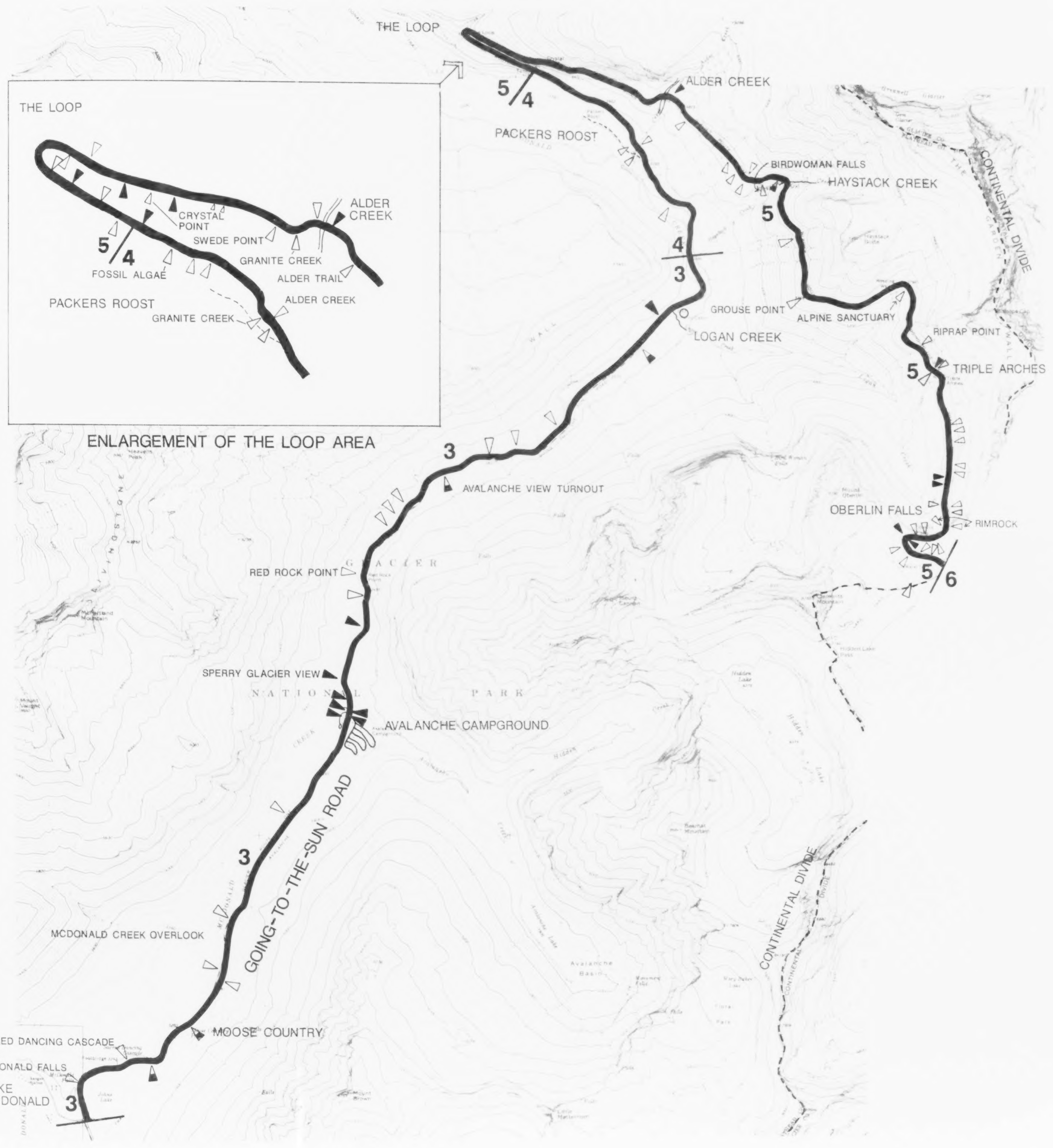
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RIMROCK
5/6
THE LOOP
CRYSTAL POINT
SWEDE POINT
ALDER CREEK
GRANITE CREEK
ALDER TRAIL
FOSSIL ALGAE
5/4
PACKERS ROOST
ALDER CREEK
GRANITE CREEK
ENLARGEMENT OF THE LOOP AREA
3
AVALANCHE VIEW TURNOUT
GLACIER
RED ROCK POINT
SPERRY GLACIER VIEW
NATIONAL PARK
AVALANCHE CAMPGROUND
GOING-TO-THE-SUN ROAD
3
MCDONALD CREEK OVERLOOK
CONTINENTAL DIVIDE
SACRED DANCING CASCADE
MOOSE COUNTRY
MCDONALD FALLS
LAKE MCDONALD
3

LEGEND

△	EXISTING TURNOUT, RETAINED
▲	TURNOUT TO BE DELETED
▲	TURNOUT TO BE ENLARGED
○	NEW TURNOUT

N

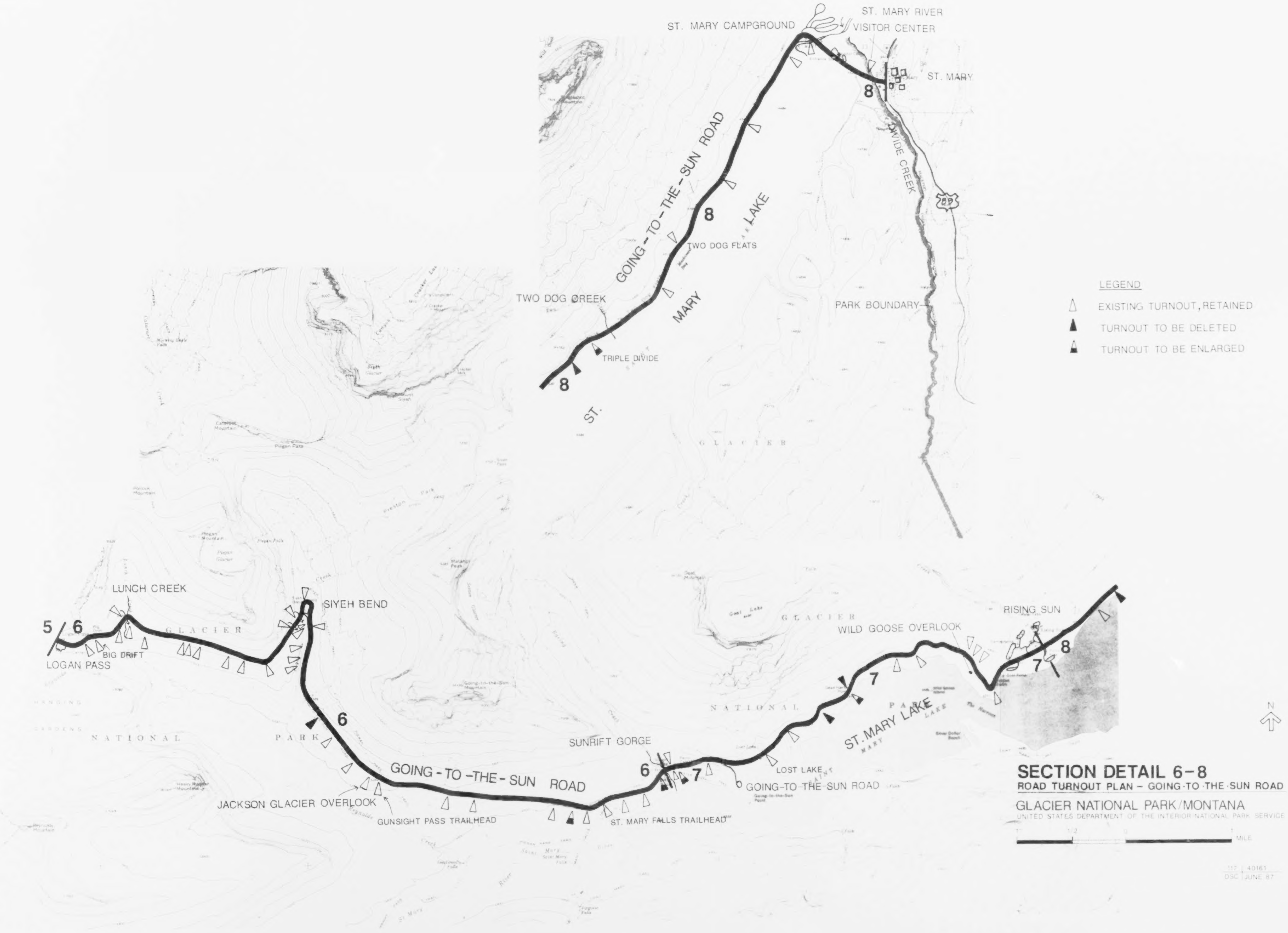
SECTION DETAIL 3-5

ROAD TURNOUT PLAN - GOING-TO-THE-SUN ROAD

GLACIER NATIONAL PARK\MONTANA
UNITED STATES DEPARTMENT OF THE INTERIOR/NATIONAL PARK SERVICE

1 1/2 0 1 MILE

117	40160
DSC	JUNE 87

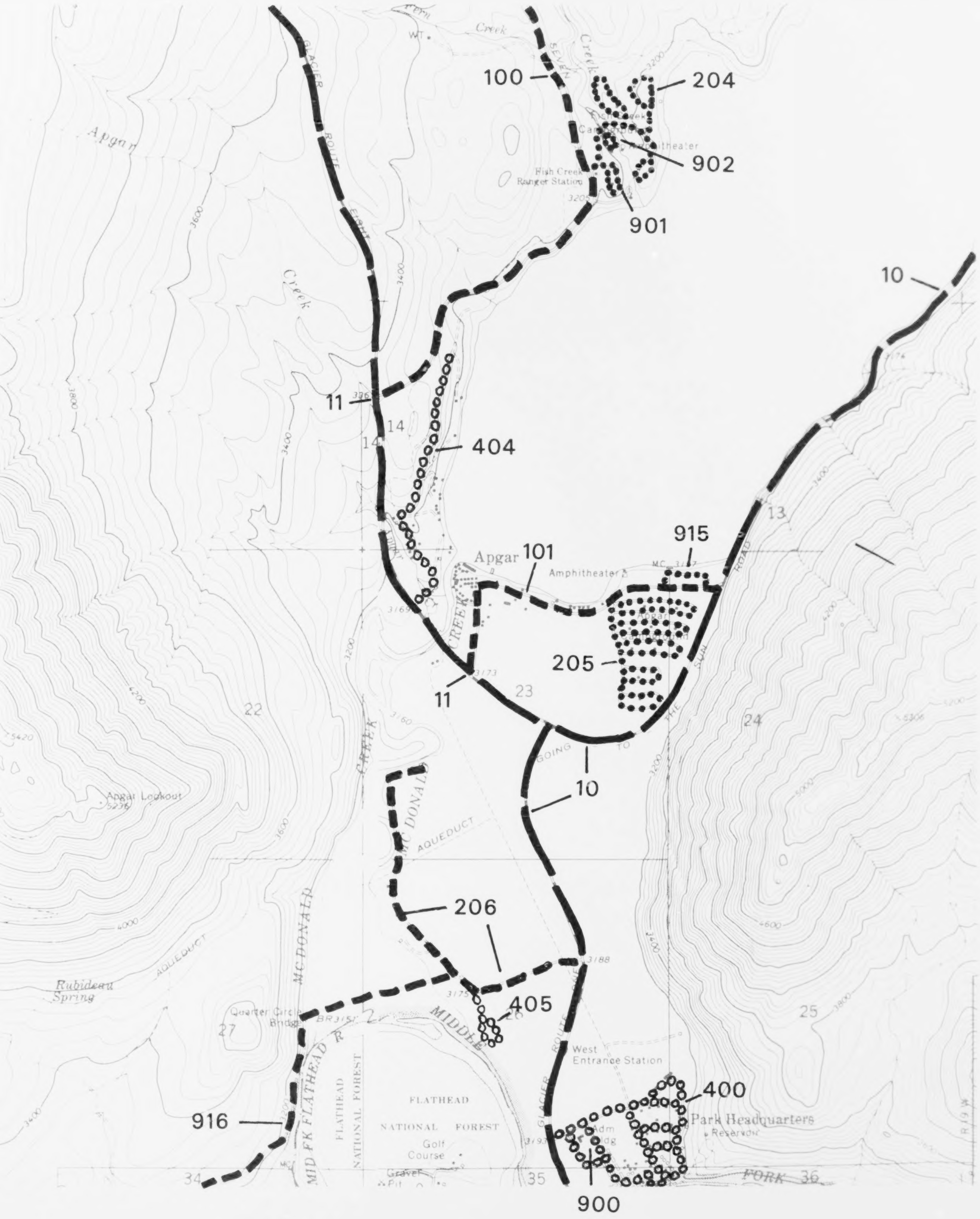

ST. MARY CAMPGROUND
ST. MARY RIVER
VISITOR CENTER
ST. MARY
8
DIVIDE CREEK
89
GOING-TO-THE-SUN ROAD
8
LAKE
MARY
ST.
TWO DOG FLATS
TWO DOG CREEK
TRIPLE DIVIDE
8
PARK BOUNDARY
GLACIER
LEGEND
EXISTING TURNOUT, RETAINED
TURNOUT TO BE DELETED
TURNOUT TO BE ENLARGED
5 / 6
LUNCH CREEK
SIYEH BEND
LOGAN PASS
BIG DRIFT
GLACIER
NATIONAL
PARK
6
GOING-TO-THE-SUN ROAD
JACKSON GLACIER OVERLOOK
GUNSIGHT PASS TRAILHEAD
ST. MARY FALLS TRAILHEAD
SUNRIFT GORGE
6
7
LOST LAKE
GOING-TO-THE-SUN ROAD
ST. MARY LAKE
7
NATIONAL
WILD GOOSE OVERLOOK
RISING SUN
7
8
N
1/2
0
1
MILE
117 | 40161
DSC | JUNE 87

SECTION DETAIL 6–8

ROAD TURNOUT PLAN – GOING·TO·THE·SUN ROAD

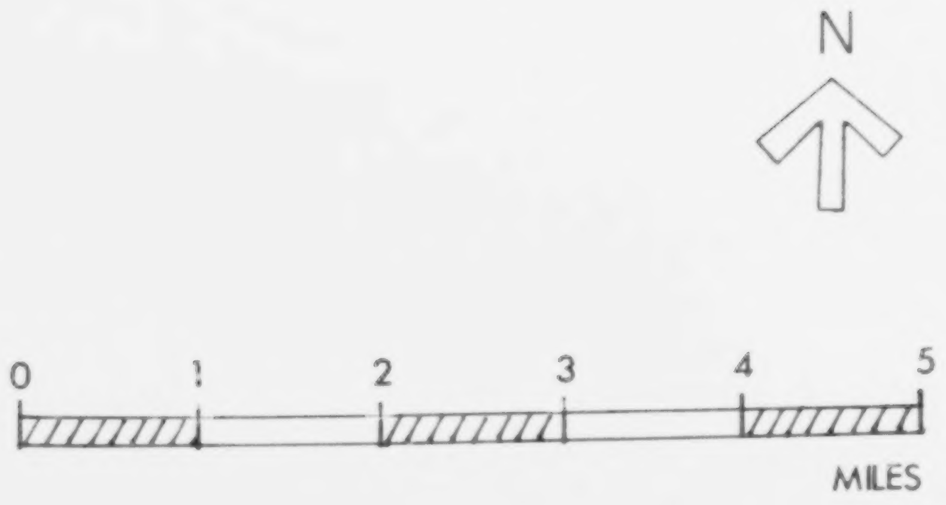
GLACIER NATIONAL PARK/MONTANA

UNITED STATES DEPARTMENT OF THE INTERIOR·NATIONAL PARK SERVICE


100
204
902
901
10
11
404
915
Apgar
101
Amphitheater
205
11
23
24
22
10
Apgar Lookout
206
405
Rubideau Spring
Quarter Circle Bridge
27
25
West Entrance Station
400
Park Headquarters
916
FLATHEAD NATIONAL FOREST
Golf Course
MIDDLE FORK FLATHEAD R
MCDONALD
34
35
36
900

ROUTE NO.	ROAD NAME
10	Going-to-the-Sun Road
11	Camas Road
100	North Fork Road
101	Apgar Loop Road
204	Fish Creek Campground
205	Apgar Campground
206	Apgar Stable Road
400	Headquarters Area Roads
404	Apgar Residence Road
405	Youth Conservation Core Road
900	Headquarters Service Area Parking
901	Fish Creek Picnic Area Parking
902	Fish Creek Amphitheatre Parking
915	Apgar Picnic Loop
916	Huckleberry Mountain Trailhead

10	ROUTE OR ROAD NUMBER
▬ ▬	CLASS I
▬▬▬▬	CLASS II
●●●●●●●●●●	CLASS III
○○○○○○○○	CLASS V


N
0
1
2
3
4
5
MILES

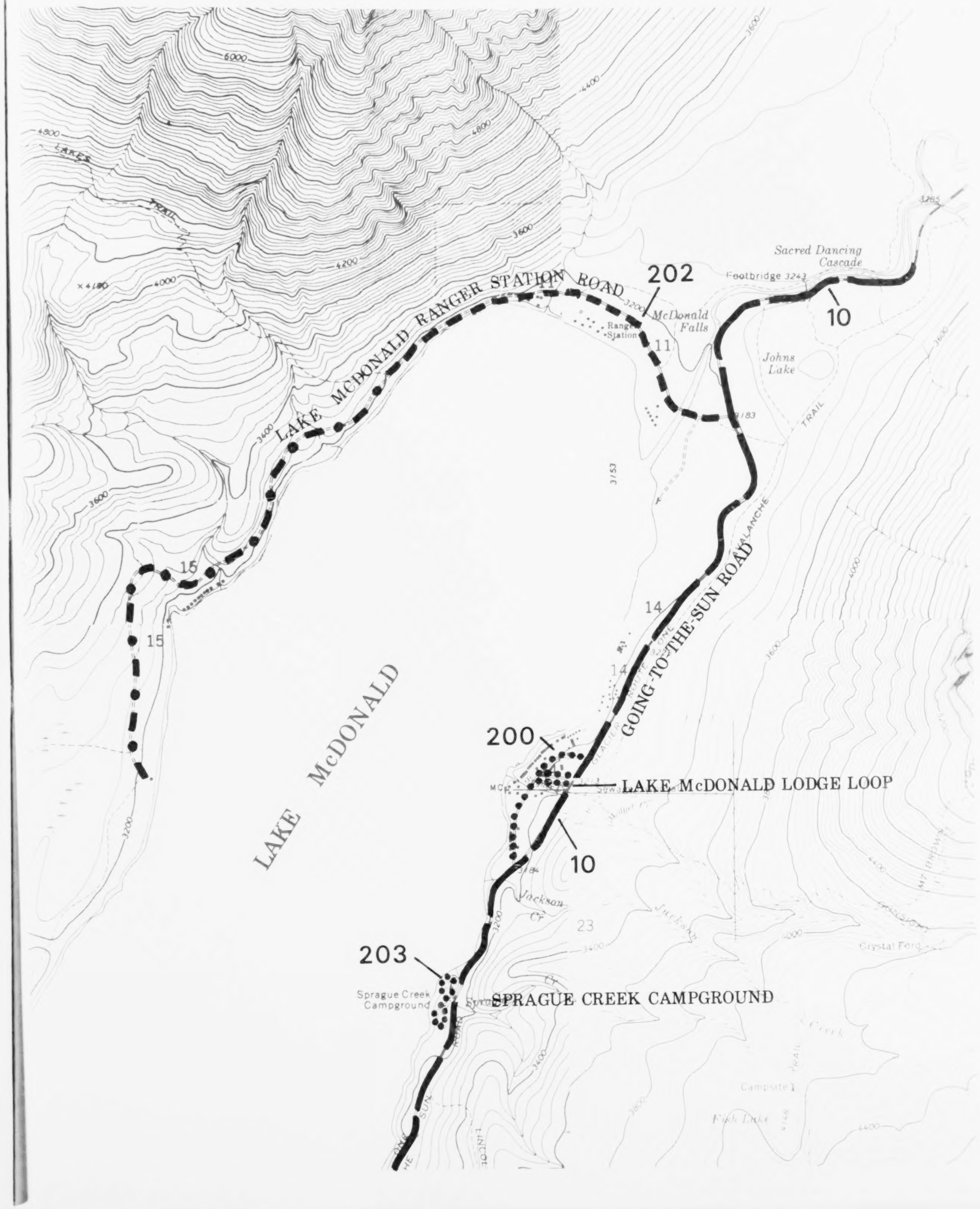
ROAD CLASSIFICATION

WEST GLACIER , APGAR DETAIL

GLACIER NATIONAL PARK
MONTANA

UNITED STATES DEPARTMENT OF THE INTERIOR / NATIONAL PARK SERVICE

117 | 40140 A
DSC | APRIL 36


202
LAKE McDONALD RANGER STATION ROAD
Sacred Dancing Cascade
Footbridge 3243
10
McDonald Falls
Ranger Station
11
Johns Lake
TRAIL
GOING-TO-THE-SUN ROAD
14
14
15
15
LAKE McDONALD
200
LAKE McDONALD LODGE LOOP
10
23
Crystal Ford
203
Sprague Creek Campground
SPRAGUE CREEK CAMPGROUND
Campsite
Fish Lake

202	ROUTE OR ROAD NUMBER
▬ ▬	CLASS I
▬ ▬ ▬	CLASS II
●●●●●●●	CLASS III
▬ ● ▬ ● ▬	CLASS VI

N

0 1 2 3 4 5
MILES

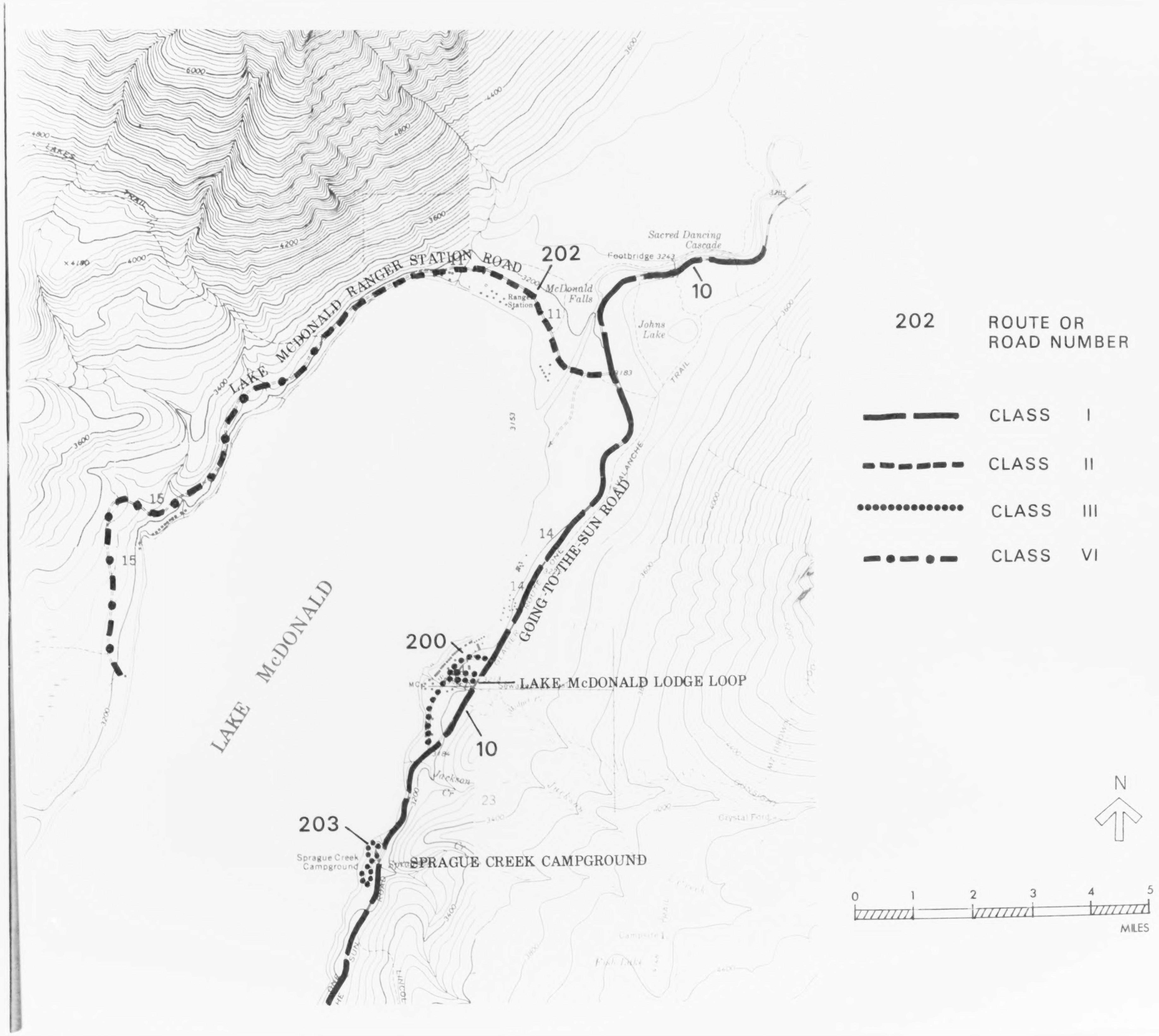
ROAD CLASSIFICATION

LAKE McDONALD DETAIL

GLACIER NATIONAL PARK
MONTANA

UNITED STATES DEPARTMENT OF THE INTERIOR /
NATIONAL PARK SERVICE

117	40143A
DSC	APRIL 86



LAKE McDONALD RANGER STATION ROAD
202
Sacred Dancing Cascade
Footbridge 3243
McDonald Falls
Ranger Station
11
10
Johns Lake
TRAIL
15
LAKE McDONALD
GOING-TO-THE-SUN ROAD
14
200
LAKE McDONALD LODGE LOOP
10
Jackson
23
203
Sprague Creek Campground
SPRAGUE CREEK CAMPGROUND
202 ROUTE OR ROAD NUMBER
CLASS I
CLASS II
CLASS III
CLASS VI
N
0
1
2
3
4
5
MILES

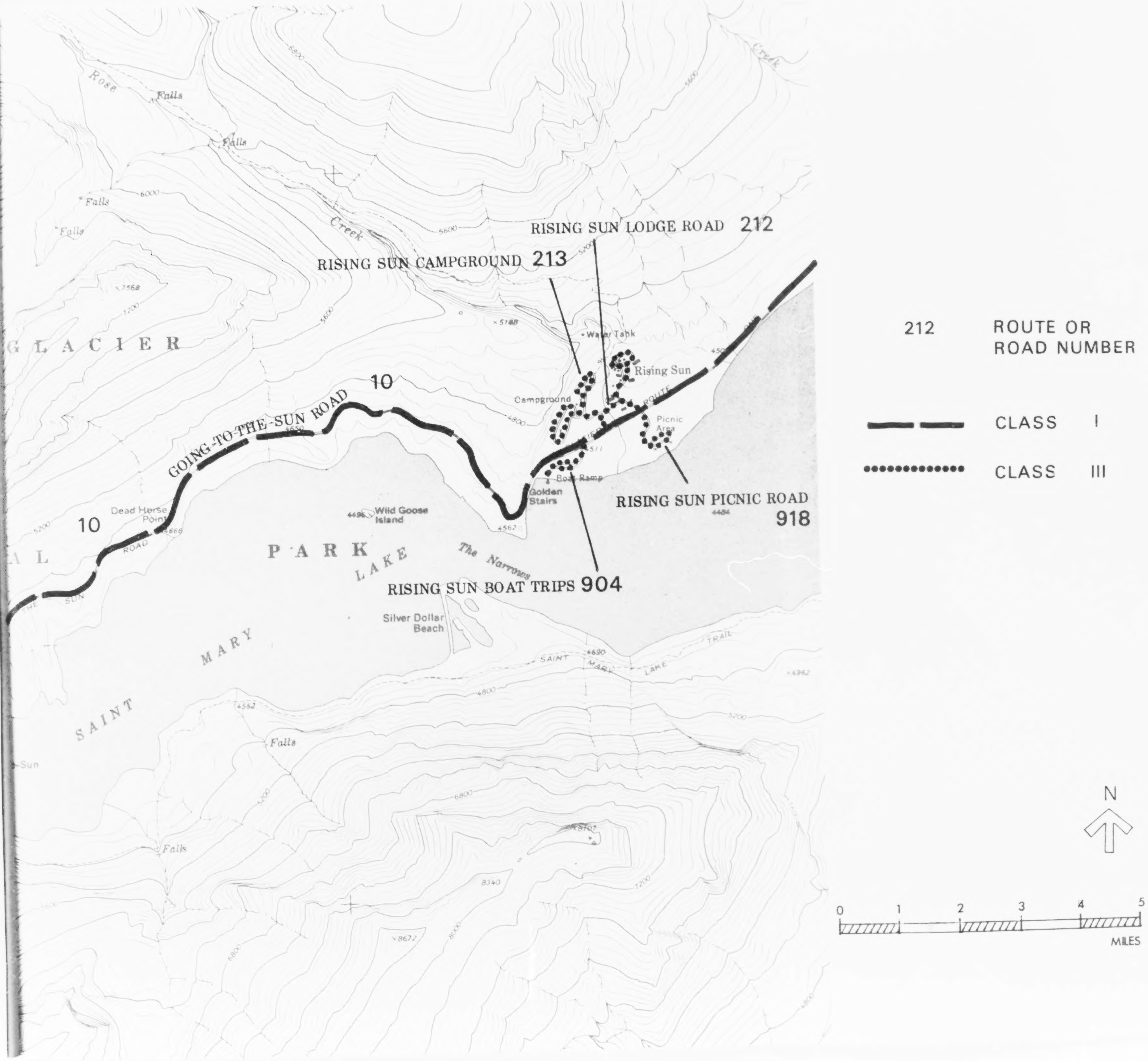
ROAD CLASSIFICATION

LAKE McDONALD DETAIL

GLACIER NATIONAL PARK
MONTANA

UNITED STATES DEPARTMENT OF THE INTERIOR / NATIONAL PARK SERVICE

117	40143A
DSC	APRIL 86


RISING SUN LODGE ROAD 212
RISING SUN CAMPGROUND 213
GOING-TO-THE-SUN ROAD
10
10
Water Tank
Rising Sun
Campground
Picnic Area
Golden Stairs
Boat Ramp
RISING SUN PICNIC ROAD 918
RISING SUN BOAT TRIPS 904
GLACIER
PARK
SAINT MARY LAKE
The Narrows
Wild Goose Island
Dead Horse Point
Silver Dollar Beach
Rose Creek
Falls
SAINT MARY LAKE TRAIL
212 ROUTE OR ROAD NUMBER
CLASS I
CLASS III
N
0 1 2 3 4 5
MILES

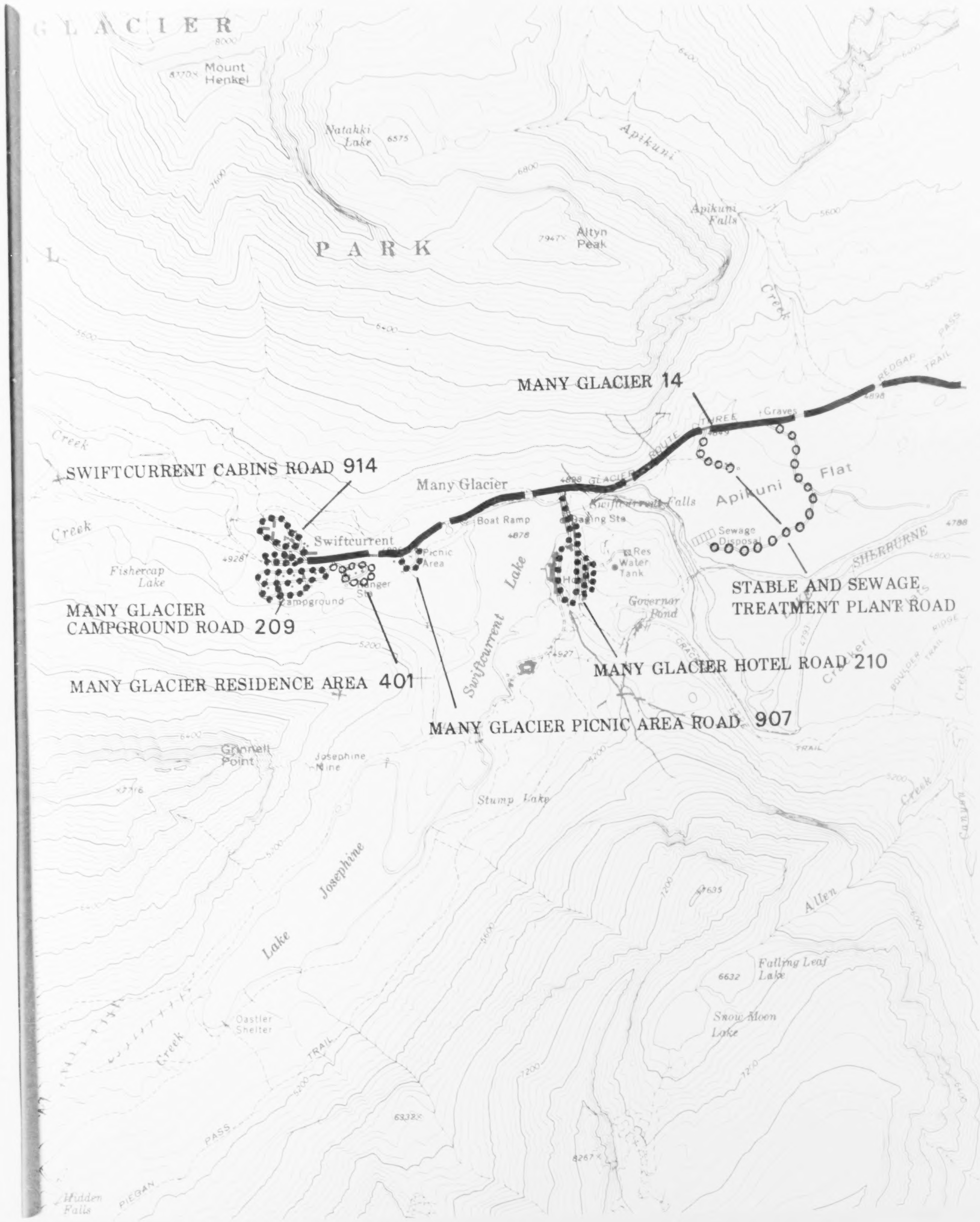
ROAD CLASSIFICATION

RISING SUN DETAIL

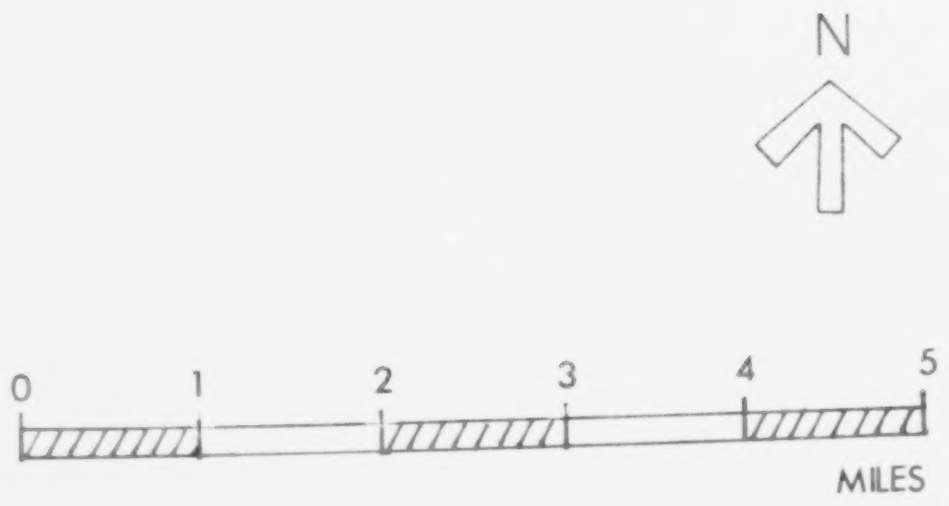
GLACIER NATIONAL PARK
MONTANA

UNITED STATES DEPARTMENT OF THE INTERIOR / NATIONAL PARK SERVICE

117 | 40142
DSC | APRIL 86


GLACIER
Mount Henkel
Natakki Lake
Apikuni
Apikuni Falls
PARK
Altyn Peak
Creek
MANY GLACIER 14
SWIFTCURRENT CABINS ROAD 914
Many Glacier
Swiftcurrent
Boat Ramp
Picnic Area
Swiftcurrent Falls
Apikuni Flat
Sewage Disposal
SHERBURNE
Fishercap Lake
Campground
Ranger Sta
Res Water Tank
Governor Pond
STABLE AND SEWAGE TREATMENT PLANT ROAD
MANY GLACIER CAMPGROUND ROAD 209
MANY GLACIER RESIDENCE AREA 401
Swiftcurrent Lake
MANY GLACIER HOTEL ROAD 210
MANY GLACIER PICNIC AREA ROAD 907
Grinnell Point
Josephine Mine
Stump Lake
Lake Josephine
Allen Creek
Falling Leaf Lake
Snow Moon Lake
Oastler Shelter
Hidden Falls
PIEGAN PASS TRAIL

14	ROUTE OR ROAD NUMBER
▬ ▬	CLASS I
••••••••••••	CLASS III
oooooooo	CLASS V


N
0
1
2
3
4
5
MILES

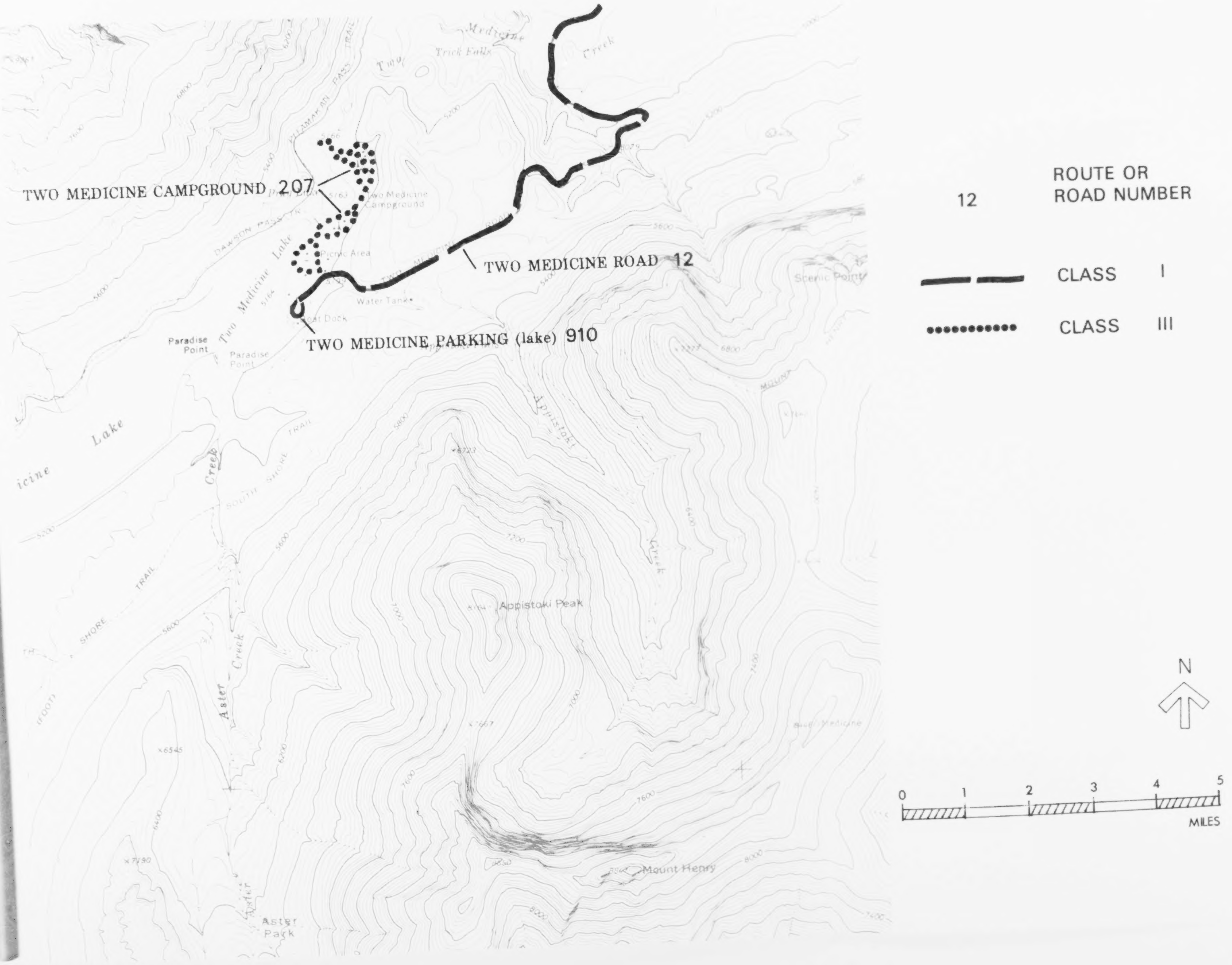
ROAD CLASSIFICATION

SWIFTCURRENT/MANY GLACIER DETAIL

GLACIER NATIONAL PARK
MONTANA

UNITED STATES DEPARTMENT OF THE INTERIOR / NATIONAL PARK SERVICE

117	40138 A
DSC	APRIL 86


TWO MEDICINE CAMPGROUND 207
TWO MEDICINE ROAD 12
TWO MEDICINE PARKING (lake) 910
Trick Falls
Two Medicine Campground
Picnic Area
Water Tank
Paradise Point
Scenic Point
Appistoki Peak
Mount Henry
Aster Park
Aster Creek
12 ROUTE OR ROAD NUMBER
CLASS I
CLASS III
N
0 1 2 3 4 5
MILES

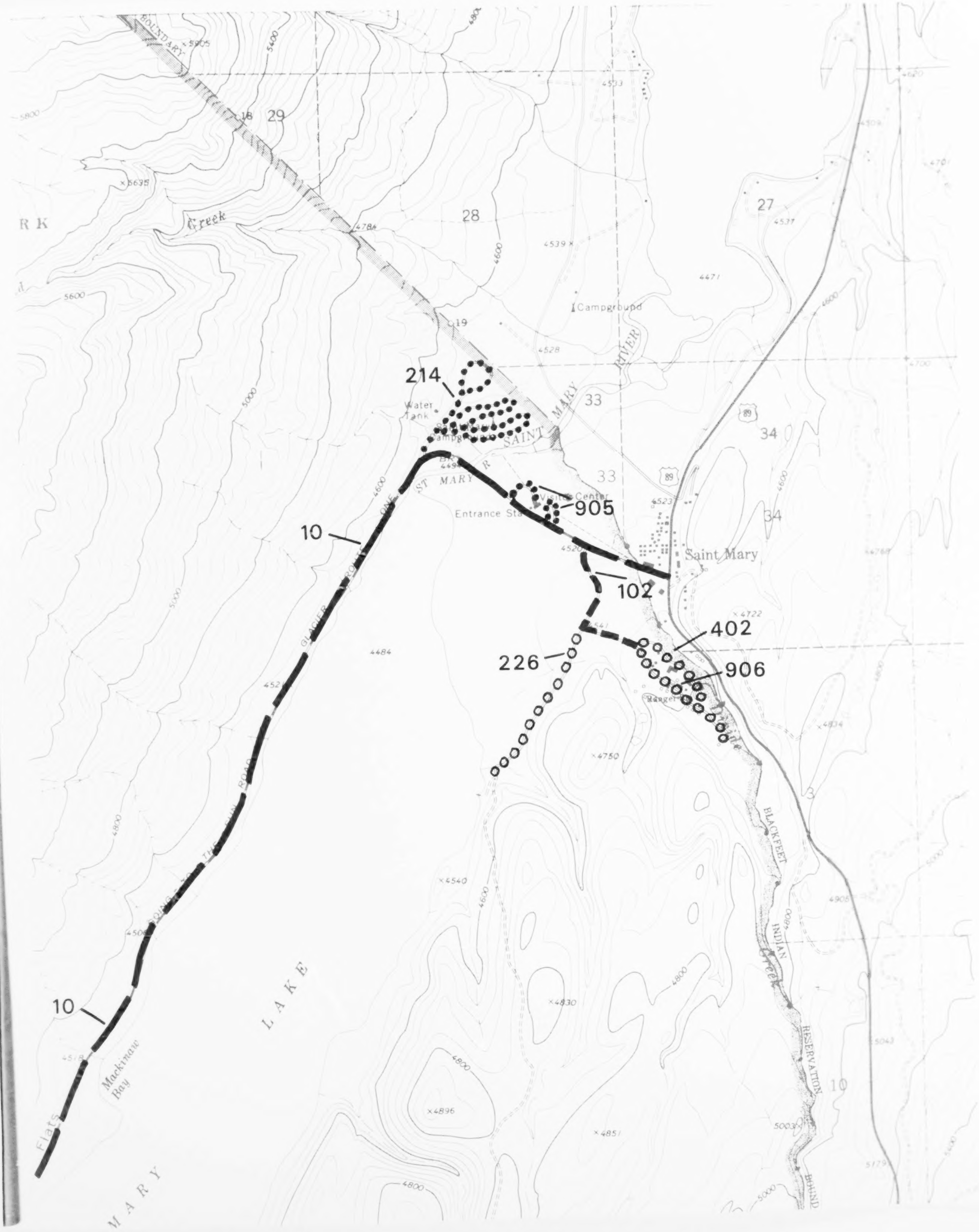
ROAD CLASSIFICATION

TWO MEDICINE DETAIL

GLACIER NATIONAL PARK
MONTANA

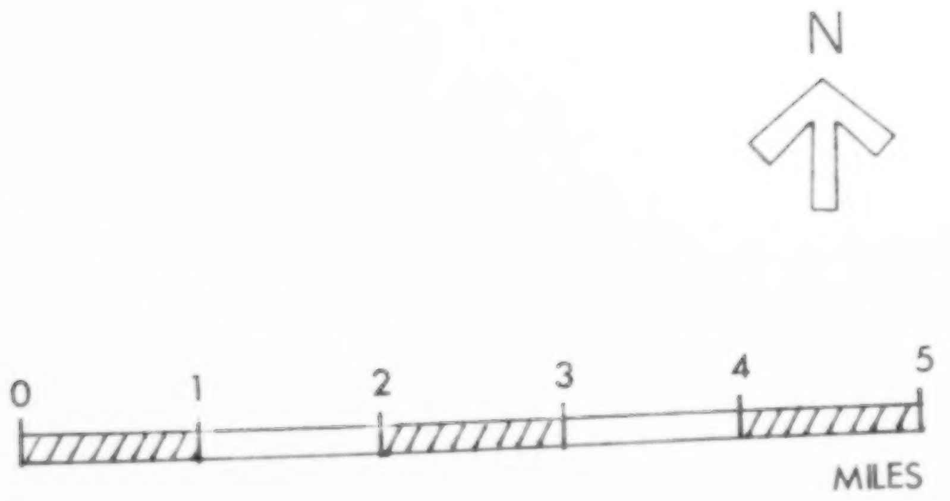
UNITED STATES DEPARTMENT OF THE INTERIOR / NATIONAL PARK SERVICE

117 | 40139
DSC | APRIL 86


214
Water Tank
Campground
SAINT MARY
905
Visitor Center
Entrance Sta
10
102
Saint Mary
402
906
226
Ranger Sta
28
29
27
33
34
Creek
LAKE
MARY
Mackinac Bay
BLACKFEET INDIAN RESERVATION
89

ROUTE NO.	ROAD NAME
10	Going-to-the-Sun Road
102	St. Mary RS Road
214	St. Mary Campground
226	St. Mary 1913 RS Road
402	St. Mary Residence
905	St. Mary Visitors Center Parking
906	St. Mary Maintenance Area Parking

214	ROUTE OR ROAD NUMBER
▬ ▬	CLASS I
▬ ▬ ▬ ▬	CLASS II
●●●●●●●●●●●	CLASS III
○○○○○○○○	CLASS V


N
0
1
2
3
4
5
MILES

ROAD CLASSIFICATION

ST. MARY DETAIL

GLACIER NATIONAL PARK
MONTANA

UNITED STATES DEPARTMENT OF THE INTERIOR / NATIONAL PARK SERVICE

117	40141 A
DSC	APRIL 86